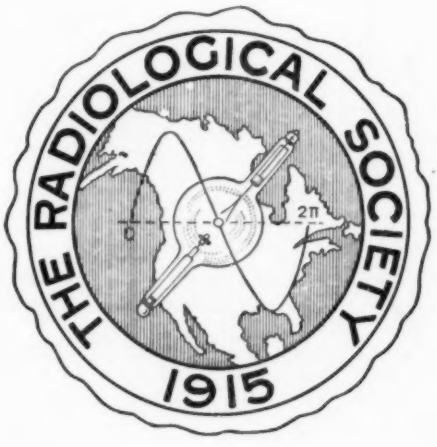
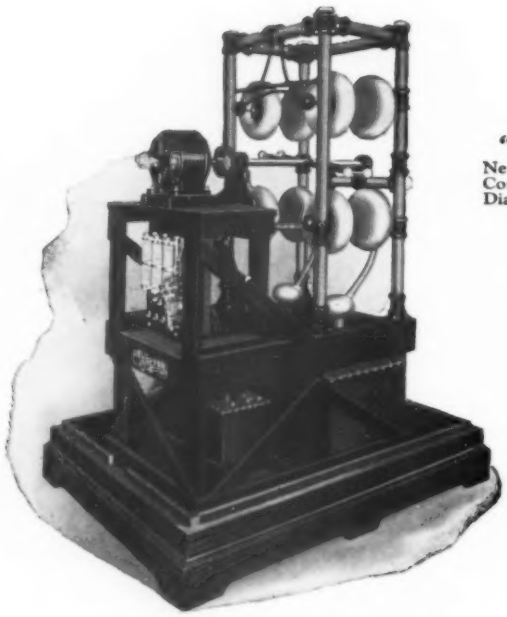
FEB 2 1923 Medical Lib.

THE JOURNAL OF RADIOLOGY

VOL. IV FEBRUARY, 1923 No. 2



PUBLISHED MONTHLY BY
THE RADIOLOGICAL SOCIETY
OF NORTH AMERICA
AT OMAHA, NEBRASKA



"SNOOK SPECIAL"
New Victor Intermediate Model Combination Deep Therapy and Diagnostic Machine.

Electrostatic Balance

Its Importance in Deep Therapy Roentgen Apparatus

THE "Snook Special" Intermediate Model for therapeutic and diagnostic work marks a new era in the design of X-ray machines. The application of the principle of electrostatic balance, another important achievement of Victor Engineering skill, is the distinguishing feature of this machine which is attracting widespread interest in the Roentgen profession.

High Voltage X-Ray machines tend to set up an intense electrostatic field, creating electrical stresses between parts. Unless these electrical stresses are equalized throughout the machine as a whole, thus preventing unequal voltage strains between various parts, tube operation will not be consistent, and damage to both machine and tube is imminent.

This dominating feature—electrostatic balance—in the "Snook Special," with distinctive mechanical features insuring performance true to the principles involved in this decidedly advanced design, are the primary reasons for the present wide discussion of this machine amongst leaders in the field of roentgenotherapy.

The machine is so designed that it can also be used for diagnostic work by simply adding the necessary Radiographic Overhead Control System.

Detailed descriptive bulletin, now in preparation, will give you pertinent facts. Write for your copy.

VICTOR X-RAY CORPORATION, Jackson Blvd. at Robey St., Chicago

Sales Offices and Service Stations in All Principal Cities

VICTOR

The JOURNAL OF RADIOLOGY
Omaha, Nebraska
VOL. IV FEBRUARY, 1923 No. 2

Sinus Disease and Lung Infections*

KENNON DUNHAM, M. D., and JOHN H. SKAVLEM, M. D.
Cincinnati

WHEN we are confronted with any case showing physical signs over the chest or symptoms referred to the lungs our chief differential diagnosis is to determine whether the lesion is tuberculous or non-tuberculous. This has been rendered more difficult by our experience with the influenza and its manifold sequelae, and our army experience, with its vast number of chest cases following gas and various acute infections.

The difficulty has become more apparent chiefly because of the realization of our limitations in a physical examination. Attempting to diagnose a case of incipient pulmonary tuberculosis by its described classical early symptoms and signs will lead any of us into error. If we will from the start regard an incipient tuberculous lesion in the lung simply as a focal infection and attack the differential diagnosis in that light we will go far in overcoming our blunders. Given any case presenting the symptoms of a focal infection, fever, fatigue, malaise, loss of weight, rapid pulse, and add to these cough, occasional spitting of blood, and localized rales over an apex there is nothing a clinician can do but to make a diagnosis of pulmonary tuberculosis. Everything we have learned in physical diagnosis will tell us to make such a diagnosis. In the large majority of cases we will be right, but again and again, if we do not go further in our study of the case we will be wrong. These minority cases are the true trouble makers which worry our minds and by mocking our prognoses injure our reputations with the patient and his kinsfolk.

In reviewing 389 cases studied in the last two years, among such patients referred by able clinicians as tuberculous, we have found 28 per cent of them to be suffering from other foci of infection. And among these non-tuberculous cases the primary focus outside the lungs has, in the vast majority of instances, been the head. So constant has been this observation that in every case presenting a non-tuberculous lung lesion we examine the air sinuses and tonsils for trouble. The work of Dr. W. V. Mullen[1] and Dr. Gerald Webb[2] in Colorado Springs has been a stimulus to such investigation. Some are so dogmatic as to state that "every case of bronchiectasis is accompanied by sinus diseases." We are not fully decided to go that far, but Dr. Dunham has stated that almost every case of purulent bronchitis or apical catarrh which has come under his observation has been accompanied by sinus infection. And what is important and interesting is that a diseased sinus can be present with absolutely no symptoms of which the patient is aware referable to the head.

Furthermore, not only is this association of pulmonary lesions and sinus disease to be sought in these cases where the lung condition proves to be definitely non-tuberculous, but given a limited, inactive, tuberculous lung lesion found on physical examination one must not be misled into explaining all the patient's complaints by this tuberculous condition. Frequently just such cases are complicated by an acute lesion which produces the symptoms. It is this combination of lesions which offers the greatest difficulty in differentiation.

In the 389 cases studied, all gave some combination of the symptoms mentioned and presented physical signs over the chest. The differential chest diagnosis was made by the study of stereoscopic x-ray plates of the chest. After determining that there was no evidence of active pulmonary tuberculosis the active focus was sought by most careful and complete physical and x-ray examinations. Our review of these 389 cases is as follows:

Uncomplicated Pulmonary Tuberculosis		270
Bronchiectasis		25
Secondary to infected antrums	8	
" " " ethmoids	4	
" " " ethmoids and antrums	13	
Apical Catarrh		42
Secondary to infected antrums	16	
" " " ethmoids	3	
" " " ethmoids and antrums	17	
" " " tonsils	3	
" " " teeth	3	
Unresolved Basal Pneumonia		18
Secondary to infected antrums	3	
" " " frontal sinuses	1	
" " " ethmoids	4	
Following Influenza	10	
Inactive pulmonary tuberculosis complicated with active nasal sinus infections		21
Hilum node infections		11
Mitral stenosis		2
Total		389

Confronted with a case showing definite symptoms and signs pointing to a lung infection how are we to attack the differentiation? In almost every case it is a task which calls for every clinical and laboratory test available, but chief and foremost in its value is the x-ray chest picture. But let us emphasize again that in almost every case of such fine differentiation we need the benefit of a complete clinical laboratory investigation.

The reading of an x-ray chest plate is a study for a specialist. Unless the anatomy, pathology and pathogenesis of the disease is accurately understood and applied in the reading, it is of comparatively little help to the clinician.

Before discussing x-ray diagnosis of lung diseases I wish to review and em-

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, December 6, 1922.

phasize such essentials of the anatomy and the pathology of these diseases as are necessary to apply in reading the plate. The division and distribution of the bronchi to each lobe of the lungs has been described and classified.[3]

In the upper lobes we have the first and second interspace trunks, each of which have anterior and posterior divisions. On the left side we have in addition the long branch which runs down into the lingual tip of the upper left lobe. Below the main stem bronchus to the upper lobe, we see the trunk to the middle lobe on the right side, running anteriorly. The branches to the lower lobes all arise from a main stem bronchus and except for anterior and posterior divisions have no special classification. The application of this knowledge is essential in localizing a lesion within the parenchyma of the lung.

The normal lymph flow through the lung, which occurs from the parenchyma toward the hilum, except for a small area which is immediately under the pleura and which may drain into the pleural lymphatics, has a vital bearing on the pathology and progress of the disease.

But of prime importance to the reading of an x-ray chest plate is a thorough understanding of the septa of the lung and their influence on the pathology. Septa are prolongations of the connective tissue from the pleura down into the lung. These connective tissue septa, rich in lymphatics, act as excellent barriers to the spread by continuity of any lung pathology characterized by exudation. Inflammatory exudation starting within any one of these small compartments between two septa, anatomically known as the "secondary lobule" of Miller [4], is definitely limited by these barriers. Spread through such a septum will not take place until cavitation occurs. The localization and restriction of the pathological changes by these septa accounts for our localized rales on physical examination and also explains the "fans".[5] Let me state, however, that these "fans" may be present in any lung disease characterized by exudation. The cellular elements of an acute pneumonia, apical catarrh or an infarct are all held in check by the septa and can consequently give localized signs and a "fan" on an x-ray plate. But the differentiation of these lesions can be made by further study with an understanding of the progressive pathology.

An exudate is the first reaction to the implantation of tubercle bacilli in the tissues of a sensitized individual. If a massive dose has gained entrance at a certain point the exudate is of the polymorphonuclear type, due undoubtedly to the reaction of the tissue to any foreign protein. But this polymorphonuclear exudate disappears in about forty-eight hours, to be replaced by the characteristic mononuclear exudate and endothelial cells. From these elements the characteristic microscopic picture of tubercle formation with giant cells, epitheiloid cells and lymphocytes is produced.

From this point the pathology progresses either to the reparative changes of fibrosis and calcification or the destructive changes of caseation, ulceration and cavitation. When an adult individual is in possession of the ordinary amount of sensitization and resistance any lesion of pulmonary tuberculosis always tends toward healing. It is also true that the lesions of an adult type of pulmonary tuberculosis are the result of repeated infections either from without or within. For instance, the first lesion within the lung of an individual case, let us say, is in the right apex. This particular lesion has gone through the pathological changes of exudation, tubercle formation, and is now present only as an old fibrotic scar. But while this oldest lesion has been moving on toward repair and healing, a newer lesion is developed at some other point lower down in the lung or in the opposite apex. This newer lesion may be the result of a spread from the original lung lesion or a new infection from without. This second lesion, we will say, is only in the state of exudation. Drawing the picture still farther, we may have developed an area of caseous bronchopneumonia in one of the lower lobes. This lesion is usually the result of the aspiration of infectious material from some apical lesion. Now, in this problematical yet typical case there are present three distinct lung lesions, all due to tuberculosis and each one in a different state of pathological change. There is represented exudate, caseation, and fibrosis.

From extensive research it has been established that the densities caused by the pathological changes of pulmonary tuberculosis, and shown on the plate, vary in their quality and degree of density, progressing from the least dense to the heaviest as follows: (1) serous exudate, (2) cellular exudate, (3) fibrosis, (4) caseation, (5) calcification. Given, then, the problematic case cited above or any case of tuberculosis showing two or more progressive lesions, the x-ray picture will be characterized by the densities of different qualities. A thorough study of chest plates with this understanding will enable you to read the changes in terms of actual pathology.

As before stated, any exudate thrown out into the lung tissue will be limited by the septa. Therefore, any lung inflammation with exudation can produce a "fan" shaped, localized density on an x-ray plate. An infarct formed by the outpouring of the blood elements will likewise give a similar density. But given any acute infection or infarct the resultant densities shown on the x-ray plate will all be of the same quality because all the lesions will be existing in the same pathological state.

The lung lesions secondary to a chronic sinus infection may be characterized by localized areas of exudate in the lung. The lesions perhaps located in the apices will give you a perfect clinical picture of incipient pulmonary tuberculosis with fever, cough, expectoration, malaise, loss of weight, blood spitting, etc., together with localized rales over the apical lesions. The x-ray picture may show you definite localized densities, but with two or more densities present they can be seen to be of the same quality. The pathological changes do not follow the progressive changes similar to tuberculosis and so the x-ray picture is different.

In a case of bronchiectasis little or nothing abnormal may be made out on an x-ray plate. Usually the only finding is a noticeable increase in the width of the trunks running to the bases or in a particular area. But even this may be absent. In such a condition the demonstration by the x-ray plate of the absence of tuberculosis, the history, symptoms and sputum analysis, together with possible thickened trunks on the x-ray plate make the diagnosis for us.

Having determined the presence of a non-tuberculous lesion in the lungs, proper handling of the case will then demand x-ray pictures of the sinuses, and, especially, the close cooperation of a competent nose and throat specialist.

Malignant tumors, such as carcinoma or sarcoma in the lungs spread by continuity, with no respect for septa. Consequently there is produced on the x-ray plate, in the greater number of cases, the usual picture of ball-like lesions. Here again the absence of apical lesions and the character of the density helps to differentiate from tuberculosis.

Conclusions

1. The first step in the differential diagnosis of lung diseases is to determine whether the lesion is tuberculous or non-tuberculous.

2. In any case of apical catarrh, purulent bronchitis, bronchiectasis or localized areas of pneumonia, infection in the head or throat should be sought.

3. The symptoms of incipient pulmonary tuberculosis are the symptoms of a focal infection.

4. A properly interpreted x-ray chest plate is the most valuable aid in the differential diagnosis of tuberculous lung

lesions and acute infections secondary to sinus disease.

REFERENCES

1. Mullin, W. V.: Accessory sinuses as etiologic factors in bronchiectasis, Ann. Otol. Rhinol. and Laryngol. 30:683, Sept., 1921; Mullin, W. V., *and* Ryder, C. T.: Studies on lymph drainage of accessory nasal sinuses. Laryngoscope, 31:158, March, 1921.

2. Webb, G. B., *and* Gilbert, G. B.: Bronchiectasis and bronchitis associated with accessory sinus disease, J.A.M.A., 86:714, March 12, 1921.

3. Dunham, H. K.: Stereoroentgenography of pulmonary tuberculosis, 1915. Southworth Co., Troy, N. Y.

4. Miller, W. S.: Anatomy of lungs, Reference Handbook of Medical Sciences, 1917 ed., William Wood & Co., New York.

5. Dunham, H. K., *and* Skavlem, J. H.: Comparative study of the pathology and x-ray densities of tuberculous lung lesions, Am. Rev. Tuberc., 5:278, June, 1921.

Can the Medical and Dental Professions Agree on Any Standardized Treatment of the Focus of Infection*

BYRON C. DARLING, M. D.
New York City

THE material presented in this paper has been compiled from about fifty-five replies to a questionnaire sent out to two hundred dentists in various parts of the country. As these men are all well known in their profession their replies may be considered as representative of what dentists are doing today with the problems presented by oral foci of infection in the form of periapical destruction and pyorrheal conditions.

I. (a) WHAT IS YOUR PRESENT OPINION AS TO EXTRACTION IN THE CASE OF A TOOTH THAT SHOWS DEFINITE PERIAPICAL PERICEMENTAL DESTRUCTION?

56% use extraction.
10% favor trying treatment first, but extract at once if treatment fails.
34% favor treatment or are undecided as to procedure.

The answers indicate that in the majority of these last cases the tooth is undoubtedly left in the jaws. It is clear, however, that the trend of good practice at the present time is distinctly toward making sure that the foci of infection are all removed.

But there seems to be no definite standard even among those who favor extraction. Thoma says, "Surgical treatment indicated." Some, like Dotterer, specify, "Extraction and curetting." Root amputation is specified by some, for the six anterior teeth. Chase, New York, makes the condition, "provided the infection is limited to the upper third of the root, and the tooth is firm in its socket." This is a definite statement. But what would you make of another who says, "Extract in cases of illness; use root amputation if the patient is healthy"? Where is the border line between health and illness, and how does the dentist propose to discover it?

Dr. Milberry of San Francisco states the general position of those who treat: "The general condition of the patient, tooth or teeth, and surrounding tissues as evidenced by a careful clinical examination and the radiogram, would determine the policy. My general contention is that the conservation of the teeth is the basis of dental practice, beginning with the earliest form of preventive dentistry and continuing throughout life where tooth conservation is not inimical to the physical welfare of the patient." But such a statement does not give a definite procedure. "When tooth conservation is inimical to the welfare of the patient" is exactly what we are trying to discover; and I maintain that a safer practice is shown by the larger group who state briefly, "Extract."

I. (b) WHAT IS YOUR PRESENT OPINION AS TO EXTRACTION IN THE CASE OF A TOOTH THAT SHOWS DEFINITE PERIAPICAL, RAREFACTION OR CHRONIC ABSCESS?

48% extract.
40% try treatment first.
12% treat.

The practice in this condition is practically the same as that shown in I (a). It is evident that the best practice at present ends in extraction. But at the same time let us bear in mind those thousands of patients who have not the good fortune to meet with the extracting dentists.

The course pursued by the 40 per cent who try treatment first may be studied in three representative answers. Van Loan of Albany states: "Extraction is better in about 90 per cent. There may be a possible 10 per cent of cases which may, if patient's vitality is favorable, recover by treatment. We think, though, that the percentage would be better 5 instead of 10 per cent." Van Loan by the "we" possibly refers not only to himself, but also to a group of dentists in Albany who are associated in a study club, one of the few signs of any standardizing of practice to be observed in the country.

II. (a) IF YOU BELIEVE IN ROOT CANAL TREATMENT OF THESE TEETH, WHAT METHOD DO YOU RECOMMEND?

Many methods are mentioned, some by name, some vaguely; it would be difficult to classify them. Several dentists gave no answer at all. Howe's method is mentioned specifically by ten dentists; Callahan's by five; Prinz's by two; Rhein's by two. That mild antiseptics are to be used is specified by two dentists only. "Different treatments" not described at all are to be used for "different conditions." *There is one unanimous warning that the canal filling must not extend beyond the apex of the root.* Stillman of New York speaks of "the principles of the accepted methods. They concur, so far as I have been able to learn." Chase of New York observes, "I have little or no faith in ionization."

One cannot but be struck with the divergence of methods and the lack of agreement as to what is the best method in any given case. Novitzky banishes them all with, "There is no possible method which will permanently embalm a dead tooth while one end of the tooth remains in the mouth."

Closely pressing the matter, to discover just when and how the x-ray is used in examination of teeth and in diagnosis, I put the next question thus:

II. (b) WHAT X-RAY APPEARANCE WILL DIFFERENTIATE THOSE FAVORABLE FOR ROOT CANAL THERAPY FROM THOSE TO BE EXTRACTED?

76% use the x-ray for differential diagnosis.
24% say it is impossible to differentiate by means of the x-ray.

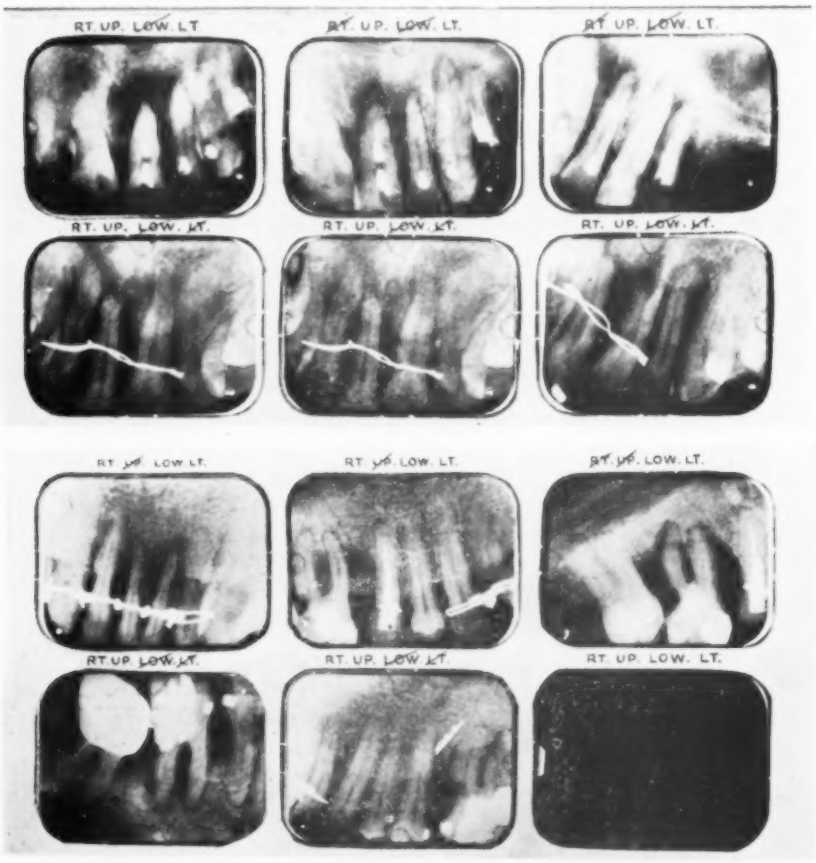
Among the latter are men like Novitsky, who hold that all dead teeth call for removal. He says: "The x-ray will not show infection. There is no way of differentiating between dead teeth said to be harmless and those that

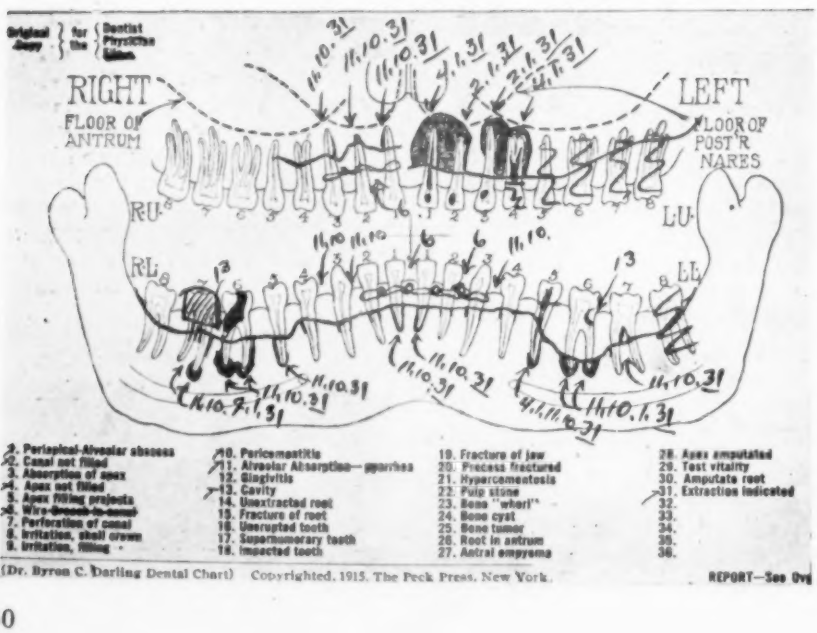
*—Read at the Annual Meeting of The Radiological Society of North America, Chicago, Dec. 10, 1921

are not. They are all infected." Vaughan also says: "I do not think you can depend on the x-ray appearance as to differentiation." These are opinions based on grounds other than indifference to the x-ray, and quite different from that dentist who says: "It is impossible adequately to describe the appearance which may lead to a conclusion."

To return to the majority who use the x-ray for differential diagnosis: Thoma summarizes his findings: "(1) Favorable anatomical conditions. (2) No periapical absorption." Hewitt, Philadelphia, says: "Where the tooth apex projects into a well defined cavity, extract or amputate. Where the rarefaction is beyond the root, and cancellated tissue is evident in translucent area, I sometimes try to treat." Conzett, Dubuque, states: "If there are any rough ends of the root showing in the radiograph, or if the area is diffused and not distinct, its treatment is contra-indicated. And all cases are suspicious that show rarefied areas in case of systemic infection." Merritt of New York discovers by the x-ray "whether the condition of the root is such as will admit of proper root filling. Crooked or malformed roots would indicate that this could not be done." In the practice of Prinz of Philadelphia "If the disturbance is confined to the periapical tissues, treatment under suitable conditions may be indicated. If, more or less, all of the pericementum is involved, the tooth must be extracted."

It is evident that to those men who try treatment of any of the cases we are discussing, the x-ray is indispensable for practical work.





II. (c) What Important Clinical Symptom or Guide, Other Than the X-ray Appearance, Will Enable You to Tell Which Teeth Will Go On to Repair and Bone Restoration and Which Are a Possible Source of Infection?

73% depend on clinical symptoms, general or local.

27% for various reasons *do not* depend upon clinical symptoms.

Of the 27 per cent, 11 per cent state definitely that *there are no clinical symptoms* which may be depended upon. The opinion of Conzett of Dubuque characterizes this group: "I have found nothing to be absolute. Clinical symptoms and data are misleading. You can prove anything by clinical experience, from scientific medicine to patent medicine." Of this group 8 per cent state that there is no *definite* guide; and 8 per cent state either that bone repair is doubtful or that repair is impossible. Potts says that from his experience, "If the infection is cleared up, it may and probably will become re-infected."

Of the 73 per cent who use clinical symptoms as a guide, 43 per cent mention the general health of the patient; 30 per cent mention the general appearance of the gums, etc. Naturally, in practice both of these are used.

The local symptoms to be considered according to Howe of Boston are: "Crepitation, a discharge on pressure, color of tissue, tenderness on tapping the tooth, firmness of tooth attachment, response to heat or cold or electric current, etc." He adds: "Most teeth in a person of ordinary health are as capable of repair as is any other tissue."

All of these symptoms are understandable and discussable. The point is that while they are important, they were always to be observed years before the x-ray was available. However, it took the x-ray to complete the picture of the diseased tooth.

My next question approached the matter from the standpoint of results of treatment:

III. DO YOU BELIEVE THAT WHERE TEETH SHOW BONE RESTORATION MORE OR LESS COMPLETE IN TWO OR THREE YEARS THIS INDICATES THAT THE TEETH ARE NO LONGER A POSSIBLE SOURCE OF INFECTION? WHY?

49% "Yes."
38% "No, for infection remains."
13% Answers are vague or not given.

Forty-nine per cent consider that infection has been eliminated if bone restoration has taken place. The reason given is that bone restoration could not take place in the presence of infection. This is a good argument, but it is not scientific; it does not stand the test of the bacteriologist. One must, however, consider the apparently good logic of the men who take the stand of Levy of New York, who says: "If you take as evidence of infective process, the formation of an area of radiolucency, by the same guide the disappearance of the area must be regarded as a removal of the infection." The answer to this is that while it has been proved that radiographic rarefaction is indicative of infection, apparent bone restoration does not mean that normal bone has been formed and all the infection eliminated. A safer assumption of experienced practitioners, as well as of research workers is: "Once diseased, always diseased." While the x-ray will detect the presence of an abnormal condition, it cannot establish that a cure has been effected, when bacteriological examination of such restored areas will show infection still present.

The 38 per cent who say that such restored teeth remain as a source of danger are supported by scientific facts. Without doubt, it is advisable that more research work be done on this subject, but the weight of the evidence at the present time even, is still with the advocates of extraction. From Novitsky comes this statement: "Microscopic examination of bone done at Stanford University in collaboration with Professor Frank E. Blaisdell, Director of the Laboratory of Surgical Pathology, has shown that these regions *are not normal.*" Stillman of New York writes: "New bone growth develops directly upon necrotic areas of bone. See Bancroft's N. Y. work on bone regeneration." Thoma says: "Cultures made from such teeth have been found positive." Hewitt, Philadelphia, finds that "A culture taken from a root canal after extensive medication may show negative, but the periapical tissue may be still infected, and

THE TEETH: The x-ray examination shows a moderate to a considerable degree of alveolar absorption indicating pyorrhea. If the dentist finds this to be active, persistent treatment will be required to check it. The teeth also show a general condition of marginal periocementitis.

Right uppers. Nos. 1 2 and 3—Wires supporting teeth; alveolar absorption—pyorrhea; pericementitis; extraction is indicated.

Left upper, No. 1—Apex not filled; periapical-alveolar abscess; extraction is indicated.

Left uppers, Nos. 2 and 3—Canal not filled; periapical-alveolar abscess; extraction is indicated.

Left upper No. 4—Apex not filled; periapical-alveolar; extraction is indicated.

Right lower, No. 1—Wire supporting teeth; alveolar absorption—pyorrhea; pericementitis; extraction is indicated.

Right lower, No 5—Alveolar absorption—pyorrhea; pericementitis; extraction is indicated.

Right lower No. 6—Cavity; canal not filled; periapical-alveolar abscess; alveolar absorption—pyorrhea; pericementitis; extraction is indicated.

Right lower, No. 7—Alveolar absorption—pyorrhea; pericementitis; canal not filled; periapical-alveolar abscess; extraction is indicated.

Left lower, No. 1—Wire supporting teeth; alveolar absorption—pyorrhea; pericementitis; extraction is indicated.

Left lowers. Nos. 2 and 3—Wire supporting teeth.

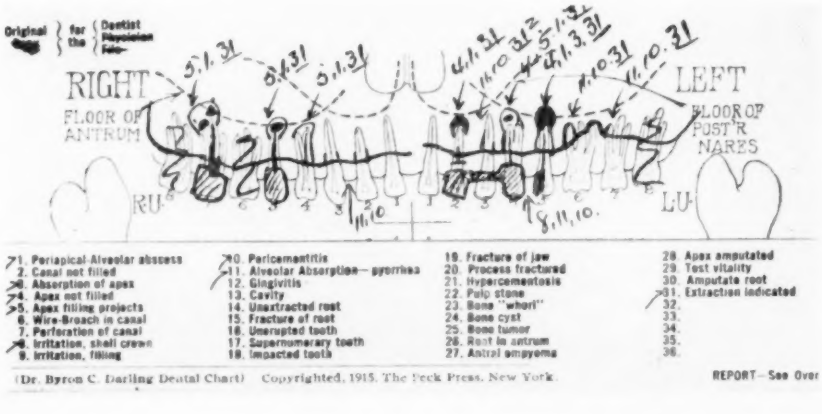
Left lower, No. 5—Apex not filled; periapica -alveolar abscess; alveolar absorption—pyorrhea; pericementitis; extraction is indicated.

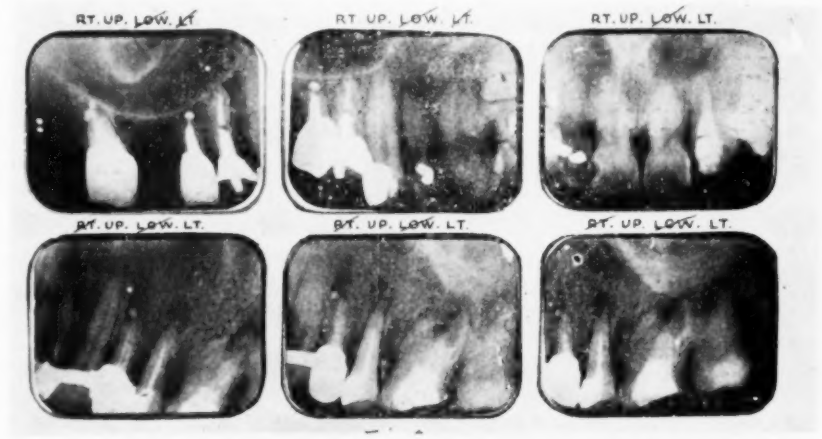
Left lower, No. 6—Cavity; alveolar absorption—pyorrhea; pericementitis; periapical-alveolar abscess; extraction is indicated.

Left lower, No. 7—Alveolar absorption—pyorrhea; pericementitis; extraction is indicated

(The above is a model of the author's report.)

NOTE—In order to get the greatest benefit from extractions many advise not to extract more than two or three at one time at intervals of from seven to ten days. Any condition of the teeth at extraction which disproves this interpretation should be communicated to me by the dentist or oral surgeon as of professional interest. The courtesy will be appreciated





THE TEETH: The x-ray examination shows a considerable degree of alveolar absorption indicating pyorrhea. If the dentist finds this to be active, persistent treatment will be required to check it. The teeth also show a general condition of marginal pericementitis.

Right uppers, Nos. 4 5 and 7—Apex filling projects; periapical-alveolar abscess; extraction is indicated.

Left upper No. 2—Apex not filled; periapical-alveolar abscess; extraction is indicated.

Left upper, No. 3—Alveolar absorption—pyorrhea; pericementitis; extraction should be considered.

Left upper, No. 4—Irritation, shell crown; alveolar absorption—pyorrhea; pericementitis; apex not filled; apex filling projects; periapical-alveolar abscess; extraction is indicated.

Left upper No. 5—Apex not filled; periapical-alveolar abscess; absorption of apex; extraction is indicated.

Left uppers, Nos. 6 and 7—Alveolar absorption—pyorrhea; pericementitis; extraction is indicated.

(The above is a model of the author's report.)

NOTE—In order to get the greatest benefit from extractions many advise not to extract more than two or three at one time, at intervals of from seven to ten days. Any condition of the teeth at extraction which disproves this interpretation should be communicated to me by the dentist or oral surgeon as of professional interest. The courtesy will be appreciated.

will re-infect the tissue adjacent to the apex."

IV. (a) Is There Any Working Basis In Your Locality? If So, Briefly, What Is It?

About Minneapolis, Best reports: "Would hesitate to say that any working basis has been agreed upon. However, general practice here is along the line of surgical removal of apical infection, opposed to devitalization of teeth, still seeking light on other problems relative to pulpless teeth. Tendency to be conservative."

From Albany, Van Loan reports: "I would say that there is coming to be a working basis among the members of our study club. Outside of that, I believe that the procedure is entirely empirical and individualistic."

Carney of New York says: "Only with the men with whom I am working. Extraction of all non-vital teeth, showing periapical absorption, whenever a general systemic symptom is present."

One practitioner, outside New York City, says: "Too much agreement is to get all the money possible."

All of this amounts to saying that generally speaking there is no working basis in the country.

IV. (b) Does Each Dentist Work it Out for Himself on the Basis of Root Canal Treatment, if Possible Withholding Extraction?

54% said that the dentist worked out each case for himself; that there was no settled procedure.

39% did not reply or said they did not know.

13% distinguished what they thought might be considered a tendency to an agreed practice, but it is more a tendency than an agreement.

To show what the tendency to agreed practice is, I quote from Marshall, San Francisco: "Apparently the dentist does not work out each case separately, but on the contrary, adheres to a radical treatment." Howe, Boston: "They are pretty apt to extract at the present time." Van Loan indicates that among his group at Albany, the procedure generally is to try one or two treatments, but if there is no sign of result, extract. For Milwaukee, Banshaf mentions the "Buckley method." Henahan, Cleveland, digresses to remark: "Dentists, the majority, the world over, hold off extraction not because of judgment, but because of sentiment." Novitsky reports only a few exceptions are agreed.

So much for what is being done towards a standardized practice, or rather, what is not being done. Now for the future, I put the next question:

V. How Would *YOU* Define or Standardize the Dental Attitude in This Matter So That the Medical and Dental Professions Can Understand Each Other?

The answers vary from that of the man who says: "The matter is distinctly a dental topic," to that of the man who says: "Dentists don't know enough to work out the problem." Please remember that these are dentists who are speaking, not medical men. Consider three statements as to standardization: "Impossible at this time." "Dentists are desirous of consulting with physicians in these matters, but object to dictation from the medical profession when it comes to extraction of teeth." Hinman, Atlanta, says: "Let each understand the other's language. Physicians and dentists should stop calling pulpless teeth 'dead.' *They are emphatically not.*"

So much for these opinions. Now consider the opposite, from a dentist who says: "The problems that confront the dental profession can not be worked out by the dentist of the day." Hyatt says: "I am interested in some research work whereby we hope to offer a standardized procedure." Gardner of Scranton thinks: "A standardized system should be suggested by medical and dental societies." Garney of New York recommends: "A conference between a committee from the County Medical Society and the First District Dental Society for this immediate vicinity."

The connection between oral infection and systemic conditions having been once established, as it has been established to the satisfaction of the mentality of even the average layman, it would seem to be incumbent upon us to establish a procedure that would allow the professions to function adequately in logical cooperation in the service of the public.

To turn to another condition in which foci of infection and systemic disturbances are involved—pyorrhea.

VI. In Pyorrhea, What Amount of Alveolar Destruction Indicates Extraction?

After carefully considering the replies to this question, it is possible to conclude that probably 50 per cent of practitioners at the present time extract when, and not until, the tooth no longer functions as a tooth; but this is a deduction from the replies rather than an exact calculation.

Eleven per cent would agree with Hutchinson, New York: "No amount of alveolar destruction indicates extraction. The retention or loss of a tooth depends on a multitude of other factors."

Three per cent, like Stillman, would say: "This cannot be determined from a radiograph."

Thirty-five per cent cannot *state briefly* the conditions of diagnosis. Of these, two may be quoted as characteristic: Howe of Boston says: "I think a dentist of experience could readily tell, and I should not know how to indicate it in a short sentence." Best of Minneapolis declares: "Impossible to answer this question in a general way, as the diagnosis might be different in different cases. For instance, to make the statement that teeth should be retained if half the alveolar support is left, and extracted if less than half this amount is left, means nothing from a diagnostic standpoint."

Eighteen per cent specify the fraction only, varying from one-third to two-thirds of the root; of these 12 per cent would extract if the destruction involved half or more than half of the root.

Thirty-three stress the importance of considering the mechanical condition of the tooth. Characteristic practice is indicated by quotations from a few replies. Prinz of Philadelphia extracts "If less than a third of the root is imbedded in bone, and there is sufficient loosening of the tooth, principally in a mesiodistal direction."

In the opinion of Novitsky: "In molars, if recession has exposed the root bifurcation, the condition is hopeless. Food impaction and the impossibility of keeping these places clean indicates tooth extraction. In other teeth, if process absorption or socket enlargement is so great as to allow excessive motion of the teeth in their sockets, tooth removal may be indicated. Scaling, temporary immobilization with splints, and the relieving of occlusal stress followed by the removal of neighboring dead teeth often holds out hope of improvement. Judging from the teeth that I have seen, that were treated by some dentists, it would be better to err on the side of removal than on the so-called conservative side."

So much for extraction to remove the infection indicated by pyorrhea. The conclusion is inevitable that prolonged and expensive treatment is often used to the detriment of the patient's general health.

VII. (a) Which is Sounder Professionally for His Diagnostic Survey, to Have the Average Dentist Consult With a Medical or Dental Roentgenologist, or Do All His Own X-ray Work and Interpretation?

58% consult.

42% do their own x-ray work, or their own interpretation, generally both.

The feeling that in order to know the angles each dentist must expose every film himself is a misapprehension.

Every tooth should be taken from two or three, or even more, angles, and the films overlapping confuse the matter so that no one can tell five minutes afterward, except in a general way, just how any one tooth was taken. The ambitious attempt of some to run mathematical lines and angles is only a passing phase. The underlying idea is to get a composite diagnostic interpretation of the condition about each tooth and apply it to the clinical examination.

VII. (b) WILL THE PUBLIC AS WELL AS THE MEDICAL AND DENTAL PROFESSIONS BE BENEFITED BY A SHARING OF THE RESPONSIBILITY BY CONSULTATION?

76% consult.

24% for one reason or another, see no use in consultation.

Extraction being the only proper procedure in the opinion of a small number, no consultation therefore is needed. Some say, "Sometimes, but rarely;" others, "When systemic disturbances are involved consultation is advisable; if the teeth only are involved, the dentist alone should decide." This brings us back to where we started: Where does the dentist stop and the medical man begin? In this connection one might point out that while dentistry might be logically considered a division of medicine, general internal medicine cannot be considered as a department of dentistry, and dentists should avoid seeming to assume the responsibilities of the medical diagnostician.

PRESENT DENTAL PRACTICE REGARDING FOCUS OF INFECTION SUMMARIZED

I. (a) Periapical pericemental destruction: 56 per cent extract; 10 per cent treat first; 34 per cent save.

I. (b) Periapical rarefaction or chronic abscess: 48 per cent extract; 40 per cent treat first; 12 per cent save.

II. (a) Method for root canal treatment: too great a divergence of methods to attempt of classification.

II. (b) Using x-ray for differential diagnosis, 76 per cent; not using x-ray, 24 per cent.

II. (c) Using clinical symptoms, 73 per cent; not depending on clinical symptoms, 27 per cent.

III. Bone restoration: 38 per cent believe infection remains; 13 per cent undecided; 49 per cent, infection cured.

IV. (a) There is no agreed working basis in the country.

IV. (b) Dentist working out each case himself, 54 per cent; slight tendency to an agreed practice, 13 per cent; uncertain, 33 per cent.

V. Majority believe that it is impossible to standardize the dental attitude at the present time; some offer the hope and suggestions.

VI. No definite standard as to what amount of alveolar destruction indicates extraction. The amount of loss of process indicating extraction varies from one-third to one-half to two-thirds.

VII. (a) Dentists doing own x-ray work, 42 per cent; favoring consultation with medical or dental roentgenologist, 58 per cent.

VII. (b) Unwilling to consult with medical profession, 24 per cent; willing to consult, 76 per cent.

In conclusion I wish to thank those who have made this paper possible by so frankly writing their opinions regarding the subjects under discussion. Even when we disagree, when we believe that they are wrong, nevertheless, as medical men, we are under deep obligation to them for the cooperation which has enabled us to take this "bird's eye" view of the general practice of dentistry throughout the country at large.

As a standard practice (for as dentists and physicians, and public we need one), I wish to recommend to you once more the principles expressed by Dr. Clarence J. Grieves in the Journal of the National Dental Association for April, 1921.

The Radiograph: "In all data submitted, the radiograph and its interpretation is a determining factor. While open to criticism, which will be discussed later, the radiograph, within clinical limitations, is the means by which the extensive occurrence of such lesions was first definitely discovered, not only about teeth, but in many other organs. It is still accepted as a most valuable diagnostic adjunct by the surgeon, so this is hardly the time for dentists to quibble over it." (1)

Indispensability of Radiograph: "The radiograph taken and developed according to the latest technique by those familiar with facial and dental anatomy, in form generally of intraoral films, sometimes extraoral plates, is simply indispensable." (2) "Serious pararadicular disease is occasionally masked by roots paralleled or superimposed on the film; but periapical rarefaction, occurring around the apex, is always visible and diagnostic of a dead apex about which the apical bone can never form, for it is negatively chemotactile." (2)

Differential Diagnosis: "How are we to distinguish between the periapically diseased tooth, where this has resulted in the subapical tissues, in touch with the blood stream (Class VI), and the apically well-filled pulpless tooth, where it has not occurred (Class V)? The answer lies in correct diagnosis of the apical disease, defining the normality of the attaching tissues, namely, cementum, periodontal membrane and alveoli; all equally as important, if not more than the pulp. (1)

"Principal among the clinical bony land-marks stands the character and stability of that hard lining of each alveolar socket known as the *lamina dura.*" (2)

Lamina Dura—its destruction is evidence of pericementitis and definite infection. "If the cells of these tissues lie in physiologic apical contact, attaching a well filled tooth from which the pulp has been removed, that tooth is healthy, no matter whether it be called a 'non-vital,' 'pulpless' or 'dead' tooth. (3) When this contact is broken, periapical infection exists beyond the tooth and can best be diagnosed by radiographic study, modified by clinical symptoms. (1)

"Its disappearance in areas, particularly in middle and apical-thirds, with thickening of the dark line representing the periodontium (pericementitis) indicates undue stress or proliferating periodonitis. (2)

Lack of continuity in the lamina is undoubtedly a most valuable symptom of infection advancing beyond the tooth; and, clinically, if it be intact, the cementum should be considered healthy." (2)

Proper Root Canal Treatment: "If pulps can be removed under as nearly aseptic conditions as possible, by careful chemico-mechanical instrumentation, leaving only inaccessible vessels and vital pulp-shreds in the immediate foraminal openings of a vital apex, which has not been cauterized nor oversterilized; or, if these strong agents can be used without their passing out into the membrane (though conservative operators prefer milder medicaments) —if all this can be accomplished without perforation and encapsulation, avoiding infection from debris, then any canal-filling method, as nearly aseptic as can be, that will close these openings well into, but not through the apex, will insure apices infected as little, and filled as much as possible, and also functional teeth." (2)

Bone Repair as Evidence of Cure is Rare: "Bone repair and sclerosis may occasionally be present as dense as cortical bone, but the trabeculae and partitions of the adjacent normal bone, to which these should be compared, are missing." (2) "Sequestra occasionally seem more radiopaque than normal bone and rarefactions may result systemically from osteoporosis, osteomalacia, pregnancy, or calcic waste; in fact, many unusual factors may, but rarely do, appear. * * * Exceptional cases cannot

be compared with the usual, and should not be quoted, disturbing confidence of honest operators seeking help, nor can they be used by dishonest operators seeking an excuse." (2)

"A cure of periapical disease may be defined as regeneration of the lamina dura and associated trabeculae, comparable to adjacent areas on vital teeth or other operated areas, following extraction and curettement. Such repair is indeed rare." (1)

Extract All Infected Teeth Showing Definite Periapical Disease: "There is little use in consuming time for a consideration of the teeth of Class VI (infected teeth, septic pulp, involved by periapical disease). They have been much discussed in former papers (2, 4, 5, 6, 7) and are really not worth while, for the reason that no adequate treatment is known which will certainly cure the suppurative, granulating, or cystic phases of apical disease, except surgery. (1)

"Any treatment of this latter type seldom succeeds; subapical bone may appear as if repaired, but soon breaks down, invading a larger area. (1)

"If there be the slightest question, it is better to err radically, and remove a doubtful tooth, than to risk inevitable damage to adjacent teeth, attaching tissues, or the maxillae and possibly the patient's health. (1)

"From an entire *pyorrhetic* denture, undermined and swaying in purulence, to a single locked periapical area walled off by condensing ostitis or sclerosis, Nature's best protective procedure, is a far cry in pathology; and yet we know the former may do less systemic harm than the latter; just as the hypertrophic pus tonsil may not be a focal factor, while the apparently normal tonsil, with its virulent crypt, may be most active." (1)

The Dentist Should Not Assume Medical Responsibilities: "The dentist, who without medical assistance of the highest order, attempts to distinguish between the sick and well patient, and who presumes by a glance and a few routine questions to determine, instantly, matters which might keep hospital laboratories busy for days, dabbles superficially in internal medicine, when he does not know the actual etiology o or sure treatment for a single dental di ease." (1)

BIBLIOGRAPHY

1. A classification of teeth with di eased pulps, Grieves, C. I., Jour. Na Dental Asso., 8:255, 1921.

2. A review of the clinical da relative to efficiency of various roo filling methods, Grieves, C. J., Jou Nat. Dental Asso., 6:113, 1919.

3. Dental histology and embryolog Noyes, F. B., Lea & Febiger, Phil delphia, 1915.

4. Systemic pus poisoning associat with diseased dental apical region Grieves, C. J., Dental Items of Inte est, 33:339, 1911.

5. Dental periapical infection t cause of systemic diseases, Grieves, J., Dental Cosmos, 56:52, 1914.

6. The relation of the vitality of t periapical cementum and adjacent t sues, etc., Grieves, C. J., Dental Co mos, 57:1, 1915.

7. The clinical status of the g givo-peridental and dento-alveolar f fective focal portals, Grieves, C. Jour. Nat. Dental Asso., 5:775, 191

Radium In Sarcoma*

W. H. B. AIKINS, M. D.
Toronto

IN CERTAIN malignant conditions radium has established itself as a specific agent. While we can never promise a cure in the treatment of any disease, the results which have been obtained in the radium treatment of rodent ulcer and early epithelioma of the skin have been so gratifying that we can almost guarantee results. The great requisite is to receive these cases early. An initial treatment is usually sufficient to produce disappearance of the local trouble and one seldom meets with a recurrence.

Unfortunately, however, such uniformity cannot be reported as the result of the radium treatment of sarcoma. fact that, as a general rule, sarcoma develops so quickly and metastases follow with such startling rapidity that the disease is far advanced before the patient appears for treatment. Then, too, although a local condition is often relieved and may be caused to disappear, the danger of metastatic development remains imminent.

The opinions of various therapists as to the value of radium in sarcoma are somewhat varied. According to the report of the London Radium Institute for 1918, radium acts on sarcoma in the following manner: "These growths being extremely vascular, necrotic changes are not so likely to occur as in the case of epitheliomata, and the stimulant action of the radium rays upon the tissue fibroblasts results in the production of much new fibrous tissue, which invades the sarcomatous masses of cells, compressing them and causing their degeneration, the tumor ultimately becoming converted into a greatly diminished dense fibrous mass." That is to say, the tumor has been transformed from a malignant to a benign neoplasm (fibroma). The fibroma, moreover, does not tend to increase in size as is usually the case even with benign growths, but to remain stationary, or to actually diminish in size.

Morson[1] has found that round-cell sarcoma is most sensitive to irradiation, that the immediate results are most encouraging, although metastases are not prevented. He considers spindle-cell sarcoma amenable if it is not growing in bone tissue, but periosteal and endosteal sarcoma more resistant. In some cases of chondro-sarcoma he has seen marked improvement, but melanotic cases give unfavorable ultimate results. Bowing[2] agrees with the view that round-cell sarcoma responds very readily and melanotic sarcoma very poo to radium and x-ray therapy. He a claims that spindle-cell and giant-c sarcomas respond more favorably th the melanotic type. This view is som what modified in the report of the Ma chester Radium Institute for 19 which states that spindle-cell sarco reacts very sluggishly to radium, a that prolonged, not too violent treatme over a long period is necessary. T report goes on to state, however, th they repay the trouble taken, for t prospect of cure is much greater th in the case of the small round-cel type, which, under radium treatme seems to melt away locally, but subs quently recurs. A similar opinion is e pressed in the report of the Lond Institute for 1919. In this rep prognosis is considered better in spind celled than in the small round-cel variety, the large round-celled type o cupying an intermediate position. Abb is very enthusiastic in his reports of t effect of the treatment of myeloid a round-cell sarcoma of the jaw and ski but he finds that the spindle-celled ty is not improved by radiation. One ca of myeloid sarcoma of the jaw wh he describes[4] is particularly interest as it was first treated in 1904, wh radium therapy was in its infancy, a it was reported in 1914 as being s

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, December 8th, 1922.

clinically cured. He also reports a case of a mixed giant-cell and spindle-cell sarcoma of the humerus which showed very marked improvement. Results obtained in the treatment of osteosarcoma are varied. Of this type Skinner[5] says: "Osteosarcoma of the maxillae and the antrum of Highmore lend themselves to a combination of surgery and radiotherapy. It seems difficult to impress surgeons with the ability of radiotherapy to influence sarcomatous tissue. For years we have been able to show results in osteosarcomas with radiant energy as a primary treatment." In speaking of osteochondroma he sounds a warning which is most timely, and might, perhaps, be heeded in the treatment of many other types, when he says: "It is necessary to ray these cases vigorously and for a period of six months after there are no signs of the recurrences left."

In the treatment of lymphosarcoma Skinner considers radiotherapy almost a specific remedy, provided the case comes for treatment while it is still a boggy mass and while the patient is still in good health. Pinch, in the report of the London Radium Institute for 1919, is more guarded regarding ultimate results. He admits that for a period of from four to six months after treatment there is marked improvement, that there generally follows recrudescence, necessitating further exposures, which may have to be repeated at varying intervals over three or four years, that these hold the disease in check, but that there comes a time when the response to radium is negligible, and the disease soon assumes the mastery. Simpson[6] finds lymphosarcoma sensitive to treatment. He considers it one of the most gratifying of all growths in its response to radium. The Manchester Radium Institute report for 1921 cites two cases of lymphosarcoma which have been alive and well between three and four years. This report states that the immediate results of radium treatment are often brilliant, but usually the disease spreads elsewhere and eventually kills the patient.

Speaking of various types of sarcomas and their response to radium, Simpson says: "Sarcoma of the skin usually responds to radium treatment; periosteal sarcoma is frequently benefited; sarcoma of the tonsil and postnasal space are, as a rule, amenable to radium treatment." This is corroborated by the report of the Manchester Radium Institute above referred to, and the reports of the London Radium Institute for 1918 and 1919. "Sarcoma of the orbital tissue recurring after operation is often benefited by radium; cases of mediastinal tumor have received great benefit from radium." Skinner holds that in epulis the postoperative use of radium is the best sort of insurance against recurrence, and, as glandular metastasis is not encountered in this condition, he points out that radiation may be limited to the original site of the lesion.

Melanotic sarcoma often responds most miraculously to treatment, but with radiation, as with any form of treatment, there always remains the constant danger of metastatic development and a fatal termination.

In the treatment of sarcoma it is essential to avoid, if at all possible, any breaking of the investing skin, for, if such should occur, it involves the possibility of hemorrhage and septic infection. It is often difficult, therefore, to obtain tissue for examination and consequently most of my diagnoses have been based entirely on clinical evidence. The treatment I have generally employed makes use of the gamma rays of radium. Flat applicators containing from five to ten milligrams of radium are applied over the mass, the dose varying in intensity in proportion to the extent and location of the lesion. In superficial sarcoma, however, e.g., conjunctiva, finger, skin, etc., beta rays are used. I have had little experience with the insertion of needles. Certain cases have been benefited; others showed little improvement; on the whole, at the present time, I am inclined to favor the use of surface applications only.

A number of the cases I shall subsequently report are very discouraging. A good many of these, however, came to me over ten years ago, when my knowledge as to the powers and limitations of radium was meager, and the result was that very often dosage was wrongly estimated and mistakes were made as to the type of case to choose for treatment. Often, too, cases are referred to me when all other possible methods have been tried. In such cases, if radium is used, it is with the understanding that such treatment can be only palliative.

The following is a summary of the sarcoma cases which I have treated:

Lymphosarcoma

My experience with lymphosarcoma has not been as encouraging as that cited above. I have found this type, as a general thing, most resistant to radiation. In many instances a microscopical examination could not be made, but of those which I knew definitely to be lymphosarcoma, three showed no improvement, two discontinued treatment, one has been held in check for three years, and one is quite cured. Of sarcoma of the neck and parotid I have had thirteen cases. Eight of these were too far advanced to hope for improvement, three were held in check for periods of two, three and four years, and two were cured.

Osteosarcoma

In osteosarcoma the results which I have obtained have been much more discouraging than those above referred to. Sarcoma of the hard palate was treated in five cases. Two were held in check, one for two years, and one for three years, one was cured, and two have not been followed up. One case of sarcoma of the upper arm gave a very striking result. This was a girl twenty years of age, with a growth on the inner aspect of the right upper arm, of six months' duration. Amputation was advised, but she refused. I referred her to a surgeon, who removed the mass and found that the tumor was periosteal, and that bone tissue was not involved. The operation was followed by radium exposures, the radium being buried in the wound, and also applied over the surface. This case was treated in 1916 and there has been no recurrence. In September of last year I treated a case of sarcoma of the upper sternum, of four months' duration, slowly increasing. A very heavy radiation was given, as a result of which the mass disappeared and there has been no recurrence since. These are outstanding cases. Many which come to me, however, have involved the bony structures and such cases have not responded favorably to treatment. Of twenty-two cases of osteosarcoma, eleven were far advanced and gave poor results, three were clinically cured, three discontinued treatment, and five showed improvement, but the disease ultimately gained control. One case of chondrosarcoma has been treated, but the result was poor.

Epulis

The effect of radium in this condition is all that one could wish. This is one type in which there seems to be unanimity of opinion. I have treated seven cases, and there has been no recurrence over periods varying from three months to seven years. This form, of course, does not metastasize, but there has been no tendency to local recurrence.

Melanotic Sarcoma

This condition is a precarious one to treat. Very often the local condition is entirely cured, but treatment is followed by metastases. In a general way, it is wiser not to interfere with melanotic spots until some activity presents itself, and renders the condition dangerous. My results have not been as discouraging as those quoted above. Of five cases treated, one showed no improvement, but metastasized rapidly, three remained clinically cured with no

metastases, and one discontinued treatment.

ANGIOSARCOMA

Four cases of this condition have been treated by me: one of the arm, one of the neck, one of the bridge of the nose, and one of the ear. All did exceptionally well, and have not recurred.

SARCOMA

Finger: I have had six cases of this condition and the results have been uniformly satisfactory. They have remained cured for periods ranging from one to seven years.

Conjunctiva: Some of my best results have been obtained in sarcoma of the conjunctiva. I have had four cases in all. One discontinued treatment and the other three have remained cured for over three years. Two of the latter had been advised that removal of the eye was imperative.

Orbit: I have had five cases of sarcoma of the orbit. Two were far advanced and derived no benefit, one discontinued treatment, one received postoperative radiation over the temple, the orbit having been removed, two were clinically cured, and are among my best results. One of these was treated in 1911 and was in excellent condition in June of this year. The other was treated in 1915 and showed no signs of recurrence when she reported to me this month. When she first came for treatment her doctor expected that she would not live more than six months.

Eyelid: Of six cases of sarcoma of the eyelid, one did not improve, one is still under observation, and four are now clinically cured after more than two years.

Nose: In two cases of sarcoma of the nose the patients were clinically cured by radiation, and one did not improve.

Two cases of adenosarcoma, one of the ovary, and one of the neck, showed little improvement. Cases of sarcoma of the larynx, breast, uterus, ovary and spinal cord derived little benefit, whereas certain cases of the temple, cheek, cutis, scalp and lip have been clinically cured. Two cases of sarcoma of the thigh were held in check for three and five years respectively. One of the groin and one of the foot gave poor results ultimately.

REFERENCES

1. Morson, A. C.: Treatment of malignant diseases by radium irradiation, Brit. J. Surg., 2:354-363, 1914-1915.

2. Bowing, H. H.: Topical applications of radium, Am. J. Roentgenol., 7:582-583, Dec., 1920.

3. Abbe, R.: Use of radium in malignant disease, Lancet, 2:524-527, August 23, 1913.

4. Abbe, R.: Present estimate of the value of radium in surgery, Med. Rec., 86:279, August 15, 1914.

5. Skinner, E. H., Malignancies of mouth and neck, Nebraska M. J., 5:194, July, 1920.

6. Simpson, F. E.: Radium Therapy, 1922. C. V. Mosby Co., St. Louis, pp. 228-240.

Bone Tumors: Sarcoma, Periosteal Group, Sclerosing Type, Osteogenic, Methods of Diagnosis and Treatment*

JOSEPH COLT BLOODGOOD, M. D.
Baltimore

I WISH to report somewhat in detail an example of this type of bone sarcoma, in order to illustrate the methods of diagnosis and attack in this type of sarcoma.

In a recent number[1] of this Journal, in a report on polycystic ostitis fibrosa, a variety of the bone cyst, I described the method of attack on central bone lesions. In *Minnesota Medicine*[2] I discussed briefly the differential diagnosis of central tumors of bone and their treatment.

This very recent observation of an example of the periosteal group of sarcoma of bone allows me to discuss the diagnosis and what seems the best treatment, based upon our experience up to date.

PERIOSTEAL SARCOMA

Ewing[3] classifies osteogenic sarcoma into the following four groups:

Periosteal (extraperiosteal)
Solid medullary and subperiosteal
Telangiectatic
Sclerosing

It is important to remember that when a lesion of bone comes under observation we cannot always diagnose it or place it in a pathological group. We can take and record a clinical history, we can make all the laboratory investigations including the x-rays, and then we can palpate. With these data at hand and recorded, it is essential to come to some conclusion as to what method of attack will give the best assurance of a permanent cure with the least mutilation. We must also bear in mind that amputation should be done without delay if the evidence indicates that this procedure offers this assurance.

From my personal studies I find it most convenient and helpful to divide lesions of bone into two great groups based upon the x-ray picture, namely, central and periosteal lesions.

In central lesions the x-ray shows a bone shell with a central light area, and on palpation one feels the bone shell and no evidence of infiltration into the soft parts.

In the periosteal lesion one can palpate a soft-part tumor which may contain no bone or little or much bone, and in the x-ray one can see a soft-part shadow with or without bone formation resting upon a shaft which may or may not show changes of bone destruction or bone formation.

When the x-ray shows a definite periosteal lesion in which sarcoma cannot be excluded the method of attack depends upon the personal view of the one responsible for deciding whether he prefers to try x-ray and radium first, because, if this is his decision there is no indication for an exploration to decide if possible the nature of the pathological process. If the lesion is inflammatory, the delay from x-ray or radium treatment can do no harm. However, if it is the view that resection or amputation should be the method of attack, delay even with x-ray and radium treatment may diminish rather than increase the probabilities of a cure.

The first object of the exploration in the periosteal group of bone sarcomas is to determine by naked eye inspection of the diseased area and the immediate frozen section, whether the lesion is benign or malignant. In view of the fact that the number of cures of periosteal sarcoma after amputation is relatively small, the amputation should not be performed unless the diagnosis at this exploratory incision is as certain as it is possible to make it.

I will first describe in detail a case which allows one to picture a logical and philosophical study of what the definite procedure should be, as based upon the evidence revealed as the study of the case continues up to and including the frozen section.

Pathol. No. 31698—Periosteal sclerosing osteogenic sarcoma of the upper end of the tibia in a white girl aged 16 with symptoms of pain and

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, December 4-8, 1922.

slight swelling of about three months' duration. (Figs. 3 and 4).

The x-rays and history of this case were brought to my attention November 26, 1922, by Dr. Robert B. Greenough of Boston. The child, aged 16, in apparently perfect health, without a definite history of trauma, observed pain in the region of the upper end of the left tibia on the medial side. This was early in September, almost three months before I saw her. There was no fever, or leukocytosis. The pain was at first intermittent, and did not interfere with function or athletics, nor did it give any particular anxiety to the patient or her family. We should stop here and emphasize the fact that *localized pain in the region of a joint or bone should be looked upon with anxiety and should be followed at once by an x-ray, which should include not only the involved area of pain, but the corresponding bone or joint.* We should constantly preach this to the public and practice what, as members of the medical profession, we preach.

The first x-ray was taken November 1, 1922. At this time the child had enough pain to prevent her from taking part in any athletic game. In the region of the inner half of the left tibia there was tenderness and a slight soft periosteal swelling without involvement of the joint and without restriction of motion in the joint. Figures 1 and 2 are anteroposterior views of both knees, taken November 1, 1922, two months after the onset of pain. I will describe what I see in these x-rays.

The most striking feature is evidence of a little new bone formation on the medial side of the upper end of the left tibia about 1.5 cm. beneath the joint, and over this area a definite thickening of the soft parts, and I am told that over this area there could be palpated a slight tender soft-part swelling. I can also see a somewhat wedge-shaped area occupying the inner head of the tibia, its base towards the periosteal growth in which the normal architecture of the cancellous bone is blurred by a cloudy defect. This means that there is either a periosteal growth of tissue, or an infiltration in the cancellous bone. In my experience this x-ray picture is more often seen in sclerosing sarcoma than in any inflammatory lesion and until recently we never had an opportunity to observe an early picture such as this.

A number of radiologists and surgeons saw this picture, and apparently the opinion of all favored a diagnosis of a low grade of osteomyelitis or tuberculosis. I have before me the typewritten copy of a number of examinations and interpretations of this case. Every examination was negative, except for this change in the x-ray, and the palpation of the soft, tender swelling, as noted above.

The lateral views, made November 1st, show no evidence of periosteal bone formation, but only the slight cloudy defect of the upper end of the tibia.

Treatment November 1, 1922: In view of the conclusion that the lesion was inflammatory—a low-grade osteomyelitis or tuberculosis—the limb was fixed in plaster and the patient allowed to walk on crutches without weight-bearing. There was little or no improvement in the pain.

Second x-ray, November 20, 1922: Figures 3 and 4 show the anteroposterior views. The interval between the x-rays of Figures 1 and 2 is nineteen days. The soft-part tumor over the inner head of the tibia is a little larger. There is a little more periosteal bone formation. There is no gross destruction of the cortical layer. The cloudy defect of the inner head

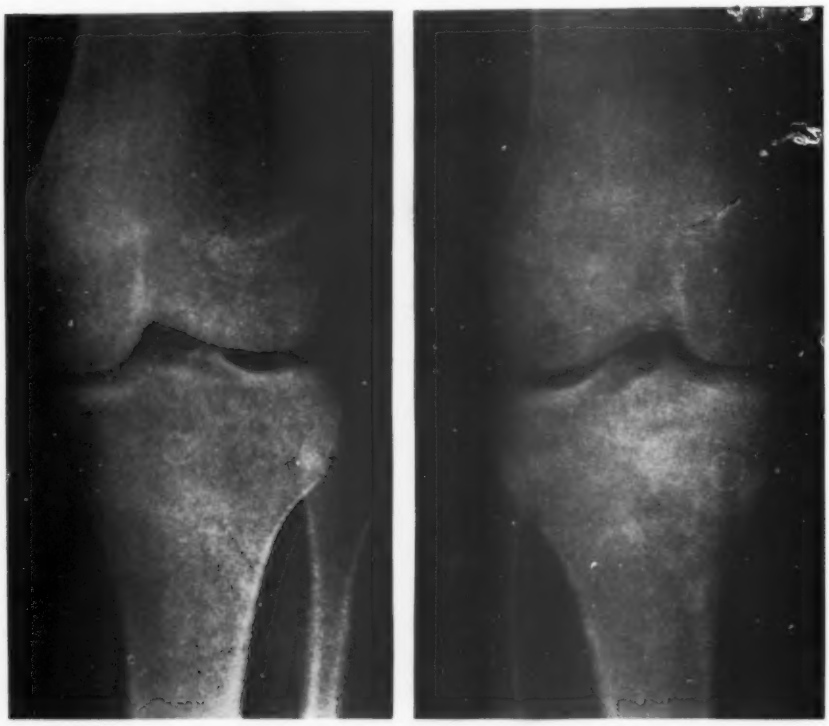
Figs. 1 and 2—(Pathol. No. 31698)—(B. T. 9)—Fig. 1, the right normal knee. Fig. 2, the left, showing the sclerosing sarcoma upper end of tibia, internal side. X-rays taken November 1, 1922.

Figs. 3 and 4—(Pathol. No. 31698)—(B. T. 9)—Fig. 3 right normal side. Fig. 4, left diseased side, sclerosing sarcoma upper end of tibia internal head. X-rays taken November 20, 1922, nineteen days after Figures 1 and 2. The soft-part periosteal tumor is a little larger; there is more periosteal bone formation; the cloudy sclerosing defect of the inner half of the upper end of the tibia is more distinct.

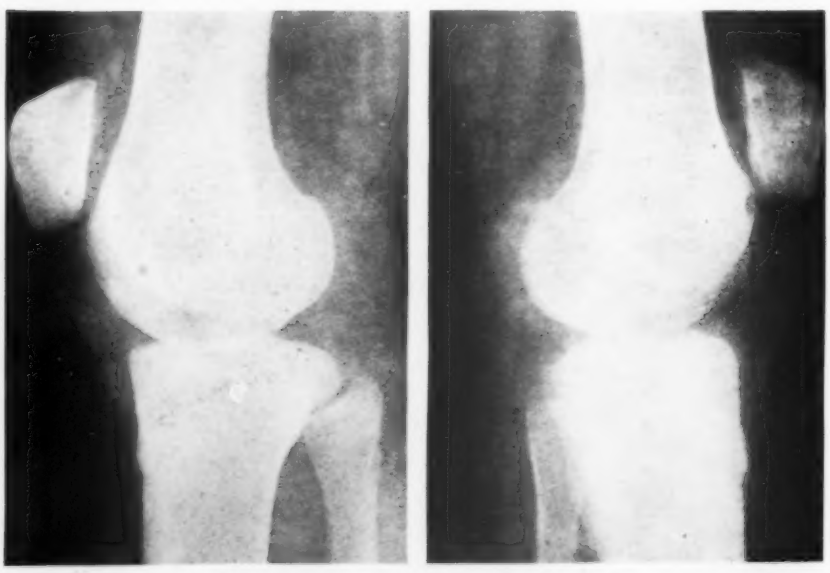
of the tibia is more distinct, and we can see that it overlaps the epiphyseal line. It is in marked contrast to the normal architecture of the outer head of the tibia.

This x-ray was studied by the previous observers, who were still of the opinion that it could more easily be explained by a low grade osteomyelitis or tuberculosis. In the lateral views of the normal and diseased side, taken November 20, there is no evidence of periosteal bone formation between the tibia and fibula, but the cloudy defect of the upper end of the tibia is distinct on the diseased side.

Third x-rays, November 28, 1922: (Figs. 5 and 6). These pictures were taken by Dr. Kahn in my office in Baltimore. The soft-part tumor seems a little larger. The lighter areas in the cloudy defect in the upper end of the tibia are getting a little larger. (For lateral views see Figures 7 and 8).



Figs. 5 and 6—(Pathol. No. 31698)—(B. T. 9)—Fig. 5, normal right side. Fig. 6, diseased left side. These x-rays were taken by Dr. Kahn, November 28, 1922, eight days after Figures 3 and 4. The periosteal soft-part tumor over the inner head of the tibia is distinctly larger. The periosteal bone formation is about the same. The cloudy shadow of the sclerosing sarcoma is perhaps a little larger. The uninvolved bone to the outer side is narrower in width.



Figs. 7 and 8—(Pathol. No. 31698)—(B. T. 9)—Fig. 7, normal right side. Fig. 8, diseased left side. Lateral views taken by Dr. Kahn November 28 1922. There is definite new periosteal bone formation from the posterior side of the upper end of the tibia, and the cloudy shadow of the sclerosing sarcoma in the upper end of the tibia is distinct.

This periosteal bone formation in Figure 8 is not present in the lateral views taken November 1 and November 20.

Examination of Patient: Young girl, aged 16, looks in perfect health. There is some visible swelling in the region of the knee joint which could be easily explained by the plaster case which hase now been removed two days. Also the restriction of flexion in the knee-joint can be explained by the fixation. As one palpates the shaft of the tibia over which there is no muscle and moves upwards, one meets a little below the level of the tubercle a soft swelling about five to eight millimeters in height covering the bone and preventing palpation of the bone. This is tender. The moment the finger feels this swelling the patient says that it hurts. The swelling continues a little above the epiphyseal line, but not to the plane of the knee joint. It cannot be felt where the tibia is covered with muscle.

Other Examinations: To repeat, these were negative both in Boston and in Baltimore. There had been and was no rise of temperature; there was no leukocytosis and no increase in the polymorphonuclear leukocytes. The x-ray of the chest gave no evidence of a possible tuberculous lesion, and no foci of infection could be made out in nose, throat or teeth.

Previous History: When the child was 15 months of age, there had been an attack of fever, followed by conjunctivitis and enlarged cervical glands. At that time the Von Pirquet test was positive, and the child was being cared for by a nurse who had tuberculous laryngitis. The child's adenoids were removed at this time, and then for several years there were recurrent attacks of conjunctivitis and bronchial asthma. With this exception, the child apparently had had no illness and was in perfect health. The father stated that the child was very fond of athletics, played tennis a great deal, and for this reason a positive contusion could not be excluded.

Discussion of the case from the clinical history, examination and x-rays: From my previous experience the picture suggested a periosteal sarcoma of the sclerosing type, but the possibility of tuberculosis would have to be considered, and this was based not on the previous history, but on the wedge-shaped area in the involved bone. In the August Journal[4] I have discussed and pictured the x-rays of the non-suppurative sclerosing osteomyelitis as described by Garre. All of my cases were adults, and in none did the clinical picture or x-ray resemble this case. I have read carefully the article of

Klemm,[5] who describes this lesion chiefly in children.

I am giving here a copy of what I dictated when Dr. Greenough and I studied the x-ray plates together and he told me about the clinical history. Neither of us at that time had examined the patient.

Remarks, November 26, 1922: "If this is sarcoma, I doubt if it could be removed by a local operation which would leave a leg with good function, because in sarcoma of this type the infiltration of the sarcoma cells is often far beyond the x-ray defect." (This was based on a microscopic study of previous similar cases). "Resection of the upper end of the tibia with bone transplantation does not give as good a functional result as amputation and an artificial limb. If amputation is to be performed it must be above the condyles of the femur.

"Amputation offers four per cent chances of a cure.[6] One of the cured cases reported in March, 1920, was a girl, aged 11 years, with a similar sclerosing sarcoma of the upper end of the tibia, in which the amputation was performed two weeks after a piece was excised for diagnosis. This case (Pathol. No. 14143) has been registered and accepted in the Codman registry. It is now nine years since the amputation. On further study I think we may offer this child a larger per cent of cure; this four per cent reported in 1920 includes both the upper and lower extremity, and as we have cured no sarcoma of the upper extremity, the chance of a cure in the lower extremity is almost eight per cent; and if we consider only sarcoma of the upper end of the tibia of the sclerosing type, we have cured one out of three, or thirty-three per cent, and another has been reported and accepted in the Codman registry.

"The wedge-shaped area suggests tuberculosis, although tuberculosis of bone without joint involvement is rare.

"The diagnosis rests between a periosteal sarcoma of the sclerosing type rapidly involving the shaft of the tibia, and tuberculosis. I have never seen chronic osteomyelitis produce a picture of this kind.

"My advice would be to employ gas anesthesia and the Esmarch rubber bandage and make a skin incision, and from then on to use the electric cautery. I would advise removing a piece of the overlying soft parts with a wedge-shaped piece of bone, burning thoroughly with the cautery and swabbing with pure carbolic followed by alcohol, then packing for ten minutes with zinc chloride fifty per cent solution.

"If the gross and the frozen section suggest sarcoma, introduce radium needles; if not, pack the wound with gauze and let it heal by granulation. If the section suggests sarcoma, submit the section to a number of pathologists and if they all agree, the decision must be made between amputation on the one hand, and radium or x-ray treatment on the other. Another evidence in favor of sarcoma is the rapid involvement of the shaft within twenty-one days.

"My personal advice would be to make immediate exploration as suggested, and if all pathologists agree as to sarcoma from the frozen section, to amputate immediately. If there is any doubt as to malignancy leave radium needles in the wound, to be followed quickly by x-ray treatment, while waiting for the further study of the section.

"There is one other possibility to be considered: If it is decided that the lesion is sarcoma, to continue removing bone up to a point that further removal would interfere with the function of the limb, and studying this bone removed, to see the effect of treatment."

Since this was written I have gone over my cases of tuberculosis of bone without joint involvement, and in not a single case is the x-ray similar to the one in this case. The x-rays show a large defect, with an intact or perforated bone shell—a picture like central bone tumor, benign or malignant. Further intensive and repeated study since this was written leads to the conclusion that only the sclerosing type of sarcoma produces an x-ray picture of the type in this case.

I have quoted this in full, because in my consultation with Dr. Greenough we both agreed that the most important thing was first to ascertain the exact nature of the pathological process, because both of us were of the opinion that if sarcoma was diagnosed, amputation should be the method of choice.

Operation: St. Agnes Hospital, November 29th, 1922. Fortunately, the father is a member of the medical profession and an unusually well trained and experienced pathologist, and he agreed with Dr. Greenough and myself that amputation should be the method of choice if at the exploratory operation we could determine that the lesion was sarcoma.

The child was anesthetized with nitrous oxide and oxygen gas throughout. A wide Martin rubber band was placed on the thigh high enough to allow an amputation above the condyles of the femur. An incision was made with the knife through the skin over the inner medial head of the upper end of the tibia. The exposed tissue was normal. The fascia was divided with the electric cautery. There was then exposed a definite growth of about eight millimeters in thickness between the periosteum and the shaft. There was no evidence of infiltration through the periosteum. When this tissue was cut and inspected it resembled sarcoma of the fibrosarcoma type, that is, with

Fig. 9—(Pathol. No. 31698)—(B. T. 9)—Photograph of a longitudinal section through the upper end of the tibia. The dark defect in the bone is the area removed and cauterized. The white dense areas around this operative cavity are produced by the sclerosing sarcoma infiltrating and replacing the cancellous bone. The line of demarkation between diseased and normal tissue is dictinct.

much intercellular connective tissue. There was no evidence of tubercular granulation tissue, nor of pus, or pyogenic granulation tissue. An immediate frozen section was made by Mr. Edward Walker, the technician of the Surgical Pathological Laboratory of the Johns Hopkins Hospital. I will discuss the method of fixation and staining later.

As the periosteal growth was stripped back with the cautery, the surface of the bone was rough with spicules of periosteal bone and minute cortical defects. The bone was too hard to remove with the cautery. For this reason a piece was chiseled, and it had the gross appearance of sclerosing sarcoma. In this type of sarcoma there remains cancellous bone, but between the little spicules of bone there is firm, white tissue. In tuberculosis we always see gray granulation tissue, and the bone about the area is softer, osteoporosis. In osteomyelitis we see granulation tissue, an entirely different picture from sclerosing sarcoma. From this bone area I was able to pick out some minute pieces of soft-part tumor without bone for frozen sections.

Gross Diagnosis: As I have described the picture which, of course, does not compare with seeing it, there could be but one conclusion—sclerosing sarcoma.

The gross appearance is shown in Figure 9 and the x-ray of a longitudinal section in Figure 10.

Frozen Sections: Figures 11, 12 and 13 are from frozen sections made at the time of the operation. The tissue was hardened in formalin and cut and stained with hematoxylin and eosin, and results were sufficiently good to make a positive diagnosis of sarcoma, but the frozen section which showed the morphology of the sarcoma cell best was made without hardening in formalin and stained with Terry's polychrome methylene blue. This technique is employed by MacCarthy and Broders in the Mayo Clinic. When I looked at these sections, I found that both the spindle and round cells were much more distinct than in the section shown in Figures 11, 12 and 13, and the nuclei were especially more distinct, and in a number of the larger spindle and round cells I could see two or three nuclei, a finding which distinguished the cells from those in inflammation. You will observe in the photomicrographs illustrated here that cells usually present in an inflammatory reaction, the lymphoid cells and the young capillaries, are absent, and the polymorphous leukocytes of osteomyelitis are absent.

The father of this patient to whom I have already referred as an experienced pathologist, agreed with the diagnosis of sarcoma and consented to the amputation, which was immediately performed.

Amputation: It was circular with skin flap only. The bone was divided above the condyle and the muscles at the level of the bone.

The vessels were carefully ligated with chromic catgut and the Esmarch bandage removed. The muscles were sutured together with chromic catgut, but not over the bone. The bone was sawed through without pushing up a periosteal flap. This method of amputation is the one that has been established as best by the recent experience of army surgeons.

Sclerosing Osteogenic Sarcoma

My studies agree with Ewing[3] that this is a distinct type, and I propose in a second communication to make a careful study with illustrations of this type of sarcoma. It seems best in this article to limit the discussion to this one case which brings out the method of diagnosis and treatment.

Similar descriptions of other types of sarcoma of bone will appear from time to time with illustrative cases as the investigation proceeds. My studies so far seem to be convincing that the sclerosing type of sarcoma of bone should be recognized in the x-ray. Its treatment will depend upon the point of view of the one responsible, the choice being between x-ray or radium radiation, and exploration, with further diagnosis by gross and frozen section, followed by resection or amputation.

The Importance of a Technician for Frozen Sections in the Operating Room

Recent experience, especially in early lesions of bone and in very young and small tumors of the breast, have convinced me that the ultimate diagnosis in an increasing number of cases must rest largely upon the microscopic study of the immediate frozen section. The accuracy of the interpretation of this section in an increasing number of cases is dependent upon the technique and the expertness of the one who makes the section; without this the possibilities of an accurate and rapid interpretation are greatly reduced.

I am very anxious to bring this important conclusion to the surgeons throughout this country, with the hope that it will influence them to start at once in the proper training of a technician to make these frozen sections in the operating room.

The Polychrome Methylene Blue Method of Terry[7] and MacCarthy

With the aid of Mr. Edward Walker, the technician of the Surgical Pathological Laboratory of the Johns Hopkins Hospital, I have given this method of Terry and MacCarthy a continuous trial since Dr. Terry spent a summer in my laboratory, some three years ago, and at the present moment I am strongly inclined to look upon these sec-

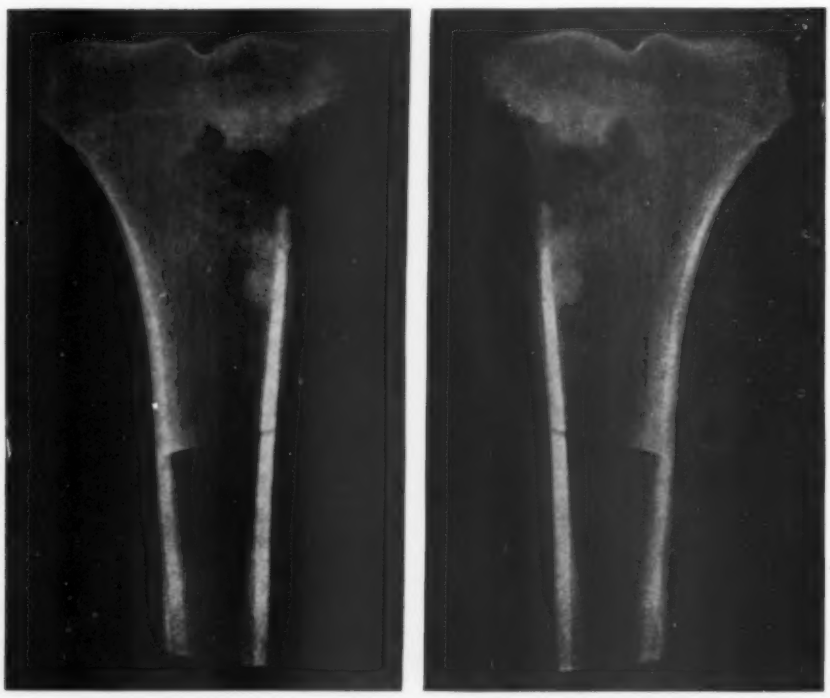


Fig. 10—(Pathol. No. 31698)—(B. T. 9)—An x-ray of the gross specimen shown in Figure 9. The cavity formation in the bone is the operative defect. The cloudy areas infiltrating the cancellous bone are sclerosing sarcoma tissue. On the inner side the disease is obliterating the epiphysical line. The periosteal tumor without bone formation shows slightly over the defect in the cortical bone. New periosteal bone formation is not seen.

tions made by freezing unhardened tissue and staining it with the polychrome methylene solution as a very important addition to the quick frozen section made after hardening in formalin and staining with eosin and hematoxylin, and I would advise my colleagues to try it.

Unfortunately for the development of this frozen section technique the number of cases in which it is essential for diagnosis is relatively small in the majority of operating rooms in this country. To develop it, it should be practiced daily by the technician and those who look through the microscope. It should become the routine procedure in every operating room, because then, when a case comes for a real test, you will have a large experience in interpretation.

REFERENCES

1. I. Radiol., 4:1, Jan., 1923.
2. Minnesota Med., 5:604, Oct., 1922.
3. Arch. Surg., 4:487, May, 1922.
4. J. Radiol., 3:310, Aug., 1922.
5. Beitr.z kiln. Chir. 80:54, 1912.
6. J. Radiol., 1:147, March, 1920.
7. J. Lab. & Clin. Med., 8: Dec., 1922.

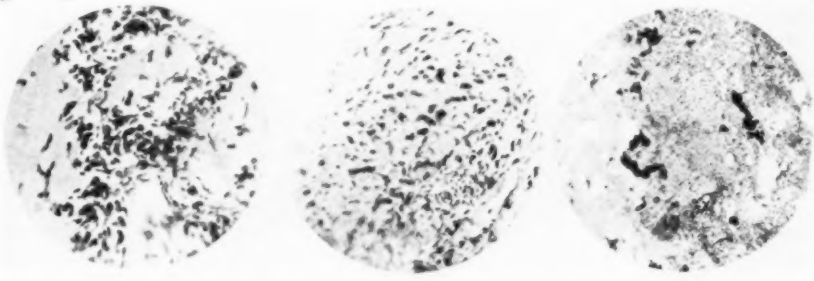


Fig. 11—(Pathol. No. 31698)—(B. T. 9)—High power of periosteal growth without bone formation, stained with eosin and hematoxylin. This shows the spindle and round sarcoma cells imbedded in the eosin-staining fibrous stroma.

Fig. 12—(Pathol. No. 31698)—(B. T. 9)—A second frozen section from the periosteal tumor; same staining as Figure 11. The sarcoma cells are more uniformly distributed in the eosin-staining fibrous matrix.

Fig 13—(Pathol. No. 31698)—(B. T. 9)—A piece picked out of the tumor area in the cancellous bone (low power); same staining as in Figures 11 and 12. This shows that the cancellous bone is largely destroyed. There remain here and there spicules of bone. This bone is replaced chiefly by a dense eosin-staining fibrous tissue in which are imbedded the sarcoma cells shown under high power in Figures 11 and 12.

X-Rays and X-Ray Apparatus: An Elementary Course*

JOHN K. ROBERTSON, Ph. D.
Associate Professor of Physics, Queen's University
Kingston, Canada

THE FOLLOWING is the first of a series of articles written primarily for those whose knowledge of physics is limited. The aim of the writer has been to present, in as simple a manner as possible, certain fundamental physical principles without a knowledge of which the intelligent use of either x-rays or x-ray apparatus is impossible. The articles are written, not for the expert roentgenologist, but rather for the novice in the field of radiology. It is hoped, too, that they will prove of use in helping any one interested to read intelligently the rapidly increasing literature on this subject.

I.
THE INTERRUPTERLESS TRANSFORMER

To operate any type of x-ray bulb, a high voltage must be applied to the terminals of the bulb. By "high" is meant a voltage which is many times greater than any of those ordinarily available. To be more definite, a dry cell of the type familiar to everybody, has a voltage between its terminals of about 1.4 volt, while a small storage battery has a value of about two volts. Between the lead wires which deliver electric power to the average householder, the common voltage is 110, although by special arrangement a supply of 220 volts may be obtained. But before useful x-rays may be obtained from a bulb, voltages of the order of 20,000 or very much higher must be used. There are on the market machines making available 300,000 volts. How are these high values obtained?

At least three different types of machines have been used for this purpose, (1) the "electrostatic" electric machine, such as the Wimshurst; (2) the transformer; (3) the induction coil. The first type is of scarcely more than historical interest in these days of powerful x-ray outfits, and need not be considered in this article. It is highly desirable, however, that every user of an x-ray bulb be familiar with the second and third types, and each of these will be discussed in detail. Both are based on two important fundamental principles, first that of electro-magnetism; second, that of electro-magnetic induction. Before proceeding to an explanation of these, a few simple electrical terms will be defined.

The volt is a unit of electrical pressure, or speaking more scientifically, of difference of potential. Voltage or difference of potential, is always necessary before any current can flow, just as difference of pressure is necessary, before water will flow along a pipe. Voltage, however, is not current any more than water pressure is the volume of water flowing per second.

Voltages available may be one of two types (1) D.C. (direct current) where the polarity never reverses, (2) A.C. (alternating current) where the direction of flow is continually reversing. A dry cell has a voltage of 1.4 (D.C.) while the ordinary hourse is generally supplied with 110 (A.C.)

The *ampere* is the unit of current and has to do with the quantity of electricity flowing past any point in a circuit per second. To make the matter more concrete, when 110 volts are applied to a 20 watt tungsten lamp, a current of about one-fifth of an ampere is flowing through the lamp; when a 600 watt electric iron is joined to the 110 volt lighting circuit, a current of from five to six amperes is flowing through the iron. The voltage causes the flow, but the current (again the quantity of electricity passing a point per second) depends both on the voltage and on the opposition to the flow between the points to which the voltage is applied—that is, it depends also on the resistance. To use a water analogy once more, water pressure causes a flow but the quantity of water flowing per second through a pipe depends both on the water pressure and on the size of the pipe.

A *rheostat* is a simple device for altering the amount of wire in an electric circuit, that is, of varying the resistance, and therefore, of regulating the magnitude of the current (within limits).

*—Received for publication December 9, 1922.

In Figure 1, if the movable arm AB is in position I, the current flows through coils 1 and 2; if the arm is moved to position II, the current must flow through coils 1, 2, 3, 4, that is, against a greater amount of resistance. Hence the current in the second case would be smaller.

A *milliampere* is just one-thousandth of an ampere. As will be seen later, the current flowing through the primary of an x-ray transformer is measured in amperes, possibly as high as 30, while the current through the x-ray bulb itself is such a small fraction of an ampere that its magnitude is invariably given in milliamperes (ma.).

The Principle of Electro-Magnetism

Most readers are familiar with the fact that when a small bar magnet is placed beneath a sheet of paper, and iron filing are sprinkled on it, the filings arrange themselves along regular lines somewhat as represented in Figure 2. This simple experiment indicates that in the whole region around the magnet there is what is called a magnetic field of force. To visualize this field we generally say that it is traversed by magnetic lines of forces, the closeness of the lines of force at any particular place being a measure of the strength of the magnetic field at that place. These lines of force are closed curves leaving the N pole of a magnet, entering the S pole and we say there is a magnetic flux through the magnet. Indeed, whenever magnetic lines are passing through any region, we speak of a magnetic flux through that region.

Suppose, now, that the wire AB (Fig. 3) is carrying a current of several amperes, and we sprinkle iron filings on a sheet of paper through which

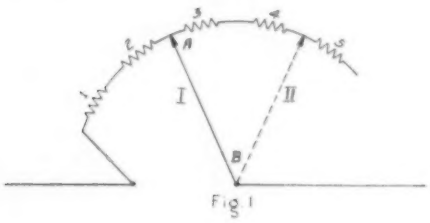


Fig 1

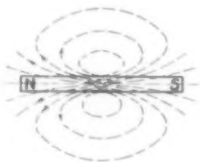


Fig 2

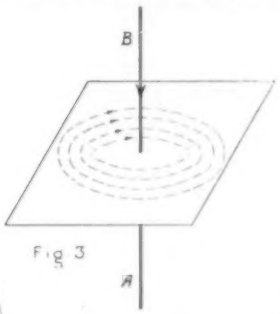


Fig 3

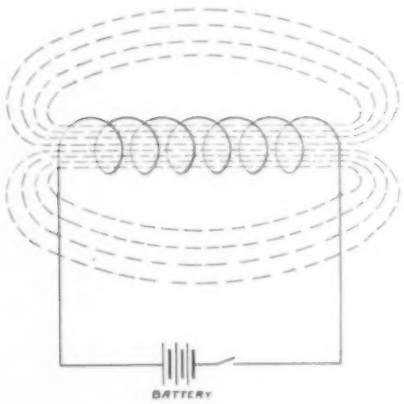


Fig 4

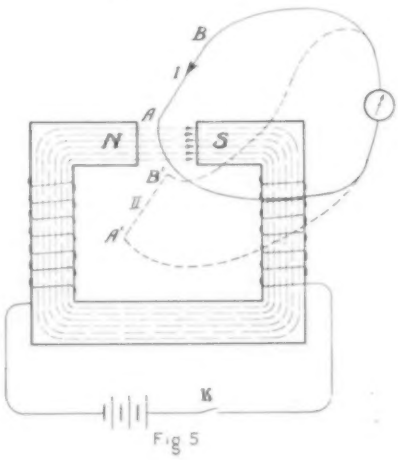


Fig 5

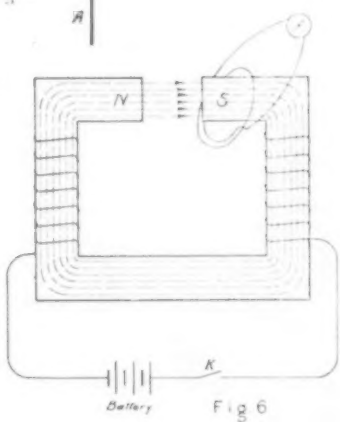


Fig 6

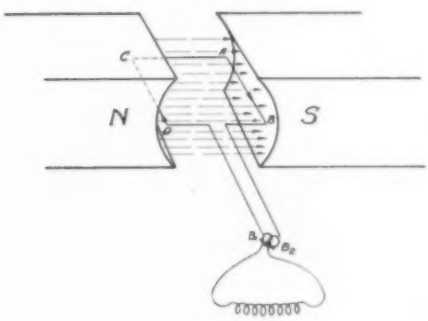


Fig 7

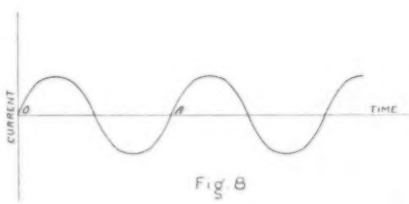


Fig 8

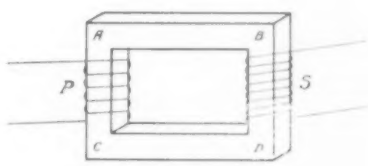


Fig 9

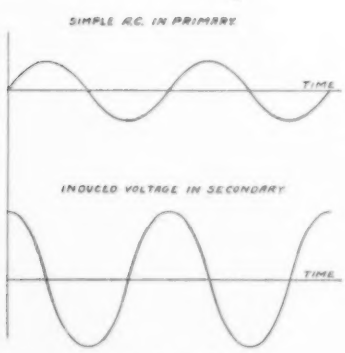


Fig 10

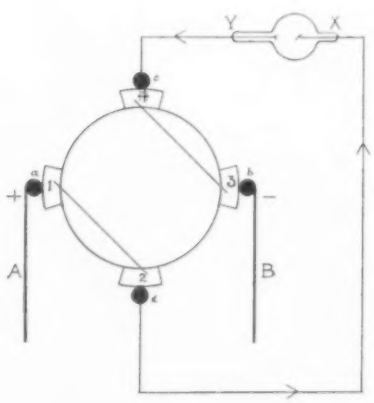


Fig 11

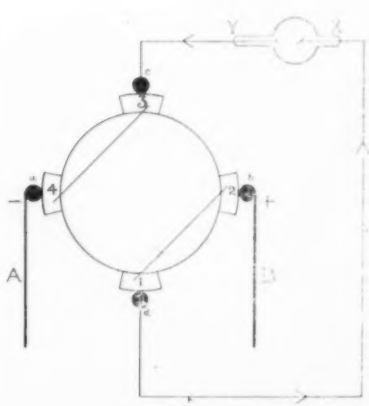


Fig 12

the wire passes. We find that, so long as the current is flowing, the filings are arranged in circular lines with the wire as centre. *A magnetic field, therefore, surrounds a wire carrying a current.* This is the fundamental principle of electro-magnetism. We can have magnetic fields subject to the control of an electric current. If a wire carrying a current is wound into what is called a solenoid (Fig. 4) it can easily be shown that one end of the solenoid acts as the north, the other end as the south pole of a bar magnet with magnetic lines of force somewhat as represented in the figure. Obviously these lines are linked with the electric circuit, and at once disappear when the electric circuit is broken. If the air inside the coil be replaced by soft iron, the soft iron becomes strongly magnetized under the influence of the magnetic field due to the current, and the number of lines of force may be increased many times. We have, in fact, an electro-magnet. Break the circuit, the lines of force disappear; make the circuit, the lines of force are introduced. Electro-magnets are frequently of the shape illustrated in Figures 5 and 6 below.

THE PRINCIPLE OF ELECTRO-MAGNETIC INDUCTION

This may best be explained by reference to one or two simple experiments. Suppose we are provided with an electro-magnet of the type illustrated in Figure 5 (where the lines of force are again represented by dotted lines) Imagine also a simple electric circuit containing a wire AB which may be readily moved, a current-measuring instrument G, but no cell or battery or other source of voltage. Suppose next the switch K controlling the electro-magnet circuit is closed and in this experiment left so. If now the wire AB is moved from position I across the lines of force to position II (A′ B′) a momentary current in the opposite direction is recorded. In general, it will be found that as long as the wire is cutting the lines of force, there is a current whose direction depends on the direction of motion of the wire. Such a current is called an induced current. the voltage causing it, an induced E.M.F. (electro-motive force). *Whenever, therefore, a portion of any circuit is moving with reference to magnetic lines of force, there is an induced E.M.F. (voltage) in that portion of the circuit, and if that circuit is closed a current results.* This is the very important principle of electro-magnetic induction.

The principle may be stated in another and possibly more useful way. This will be evident from another look at Figure 5. When the movable wire is in position A′ B′ there are no lines of force linked with this circuit,, but when it is in position A′ B′ all the lines of the electro-magnet are linked or interlocked with it. We frequently say, therefore, that an induced voltage results in an electric circuit whenever there is any change in the number of lines of force linked or interlocked with it. To emphasize this, we shall perform another experiment. Imagine the movable wire in position A′ B′. If, now, the electro-magnet circuit (which we shall call the primary) is broken, a momentary induced current results in the movable wire circuit, which we shall call the secondary. Again, when the primary circuit is made, a momentary current in the opposite direction results in the secondary. In this experiment, the secondary circuit is not moved, but the magnetic lines of force either disappear or reappear, and there is relative motion of magnetic lines and a portion of a circuit, and so an induced current results. Putting it in the other way, at "break" of the primary, there is a decrease in the number of lines linked with the secondary; at "make" an increase—in both, a change and an induced voltage results.

MAGNITUDE OF INDUCED VOLTAGE

This involves a consideration of two other points. (1) If the wire AB (Fig. 5) be moved from position I to position II at two different rates, for example one ten times faster than the other, it will be found that the induced current is just ten times as great, although it will, of course, last for a correspondingly shorter time. In other words, the magnitude of an induced voltage depends on the rate at which the change in the number of linkings takes place. The faster the change, or the more quickly lines are cut, the higher the induced voltage.

(1) If the secondary circuit be altered, as represented in Figure 6, so that the magnetic lines of force link the circuit twice, it will be found that on "break", of the primary circuit the induced voltage is twice that obtained previously. If the secondary circuit links the lines ten times, then the induced voltage would be ten times as great, and so on.

To sum up: The magnitude of an induced voltage in any circuit depends (1) on the rate at which a change in the number of magnetic lines linking a circuit takes place, and (2) the number of times the lines are linked with the circuit. It follows, therefore, that if a circuit is linked a large number of times with magnetic lines, and these disappear (or are introduced) very quickly, that extremely high voltage may be induced.

MEANING OF A. C.—SINUSOIDAL

Suppose a single loop of wire, ABCD, Figure 7, is rotated in the region between two powerful magnetic poles N and S. As the wire AB goes down it cuts across lines of force and in it we have an induced voltage in the direction of the arrow. At the same time the portion of the loop CD goes up, thus cutting the same lines in the opposite direction, and an induced voltage in the opposite direction (Sec. 4) results. If, now, the ends of the loop are connected to two slip rings, upon which rest brushes B_1 and B_2 connected by some external conducting circuit, an induced current may flow. Evidently, all the time AB is going down and CD up (that is, for half a revolution) a circuit will flow through this circuit in the direction indicated by the arrows. When AB reaches its lowest position, however, it begins to move up, and then the direction of the induced voltage will change. At the same time, the wire CD will have reversed its direction (up to down) and in it, too, the induced voltage reverses. It follows, therefore, that during the second half revolution the current throughout the circuit will flow in the opposite direction to that during the first, and that as rotation continues, the current reverses in direction every half revolution.

Not only, however, is there a reversal of current (or, if you like, of polarity between the brush B_1 and B_2) but the strength of the current is continually changing. This will be evident if it is realized that when the wire AB is passing through its highest position and the wire CD through its lowest, each wire is moving parallel to the magnetic lines and hence for a short interval of time there is no cutting and, therefore, no induced voltage and no current. As AB goes down (and CD up) the lines are cut more and more quickly, until after one-quarter of a revolution both AB and CD are moving directly at right angles to the lines. At this instant, therefore, the magnetic lines are cut at the fastest rate and the biggest induced voltage results. For the next quarter of a revolution, the lines are cut less and less quickly until AB reaches the bottom (CD the top) and once more, for a brief moment, each wire is moving parallel to the lines, and the voltage has dropped to zero again. Evidently, then, during one complete revolution, the current in the circuit will gradually rise in one direction to a maximum value, drop until it is zero, from which it gradually climbs to a maximum, again falling to zero.

If the loop is rotated at steady speed, and in a uniform magnetic field, the manner in which the current changes with time is represented graphically in Figure 8.

A current of this type is an alternating one (A.C.) as well as sinusoidal. Obviously, a sinusoidal current is characterized by (1) changing polarity and (2) gradual, "smooth" changes in intensity. In passing, it may be noted that by using a mechanical means such as a revolving drum, to put in and take out resistance gradually from a circuit, sinusoidal effects without changing the polarity may be obtained.

It is well to note that while a sinusoidal current is always A.C., it is possible to have alternating currents which are not sinusoidal.

Two or three important terms should be noted.

A cycle refers to the complete change from zero to a maximum in one direction, down through zero to a maximum in the other direction and back again to zero. In Figure 8, OA represents a cycle.

The *frequency* of A.C. is the number of cycles per second. Most householders on the American continent are supplied with A.C. at 110 volts, with a frequency of 60 or 30 cycles per second.

Neither this voltage nor this frequency could be generated with a simple machine of the type illustrated. In the practical A.C. generators or dynamos found in power houses, the desired frequency and voltage are obtained by using several sets of magnet poles, alternately north and south, and many loops of wire. The fundamental principles utilized, however, are the same as those we have been discussing and the current supplied by such generators generally approximats fairly closely the sinusoidal.

The High Tension Transformer

We are now in a position to explain the principle of the high tension transformer.

In Figure 9, ABCD represents a series of sheets of soft iron put together to form a "core" of iron of the shape illustrated. A coil of wire P, the primary, which is connected with a source of 110 volts (A.C.) is wrapped about one arm of the iron core. When this primary circuit is closed, the alternating current will magnetize the iron core, first with lines running in one direction, then in the opposite. As the iron core is of the shape illustrated, the lines, whatever their direction, run somewhat as represented by the dotted lines. Suppose, now, a second coil S, the secondary, is wrapped about another portion of the iron core. Evidently the magnetic lines, when present, are linked with each turn of this coil. Moreover, the number of lines linked with the coil is continually changing. As the number of lines is rising to a maximum (increasing) in one direction, we shall have an induced voltage in coil P in one direction; as the number decreases, there will be an induced voltage in the opposite direction. Without going into further detail, corresponding to current changes in the primary, there will be induced voltages in the secondary which vary in the manner represented in Figure 10.

There is, therefore, an induced voltage in the secondary which is alternating (A.C.) and of the same frequency as that of the primary. Concerning the magnitude of this induced voltage, it should be evident (Sec. 5) that by using a large number of turns in the secondary, extremely high values may be obtained. As a matter of fact, the voltage is "stepped-up" roughly in the ratio of the number of turns of the secondary to the number of turns of the primary. High tension transformers are now on the market, which it is the claim of the makers, will deliver a voltage as high as 300,000.

Necessity of Rectification

For the satisfactory use of any x-ray bulb the current flowing through it must always be uni-directional. It may be intermittent but unless its direction is always the same, and correct, the results on the tube may be disastrous. As a rule, therefore (one or two exceptions will be noted later), the high tension transformer because it delivers alternating current, is not sufficient for a complete x-ray high voltage outfit. Some device must be added so that the current through the tube is always in the same direction. Either one-half of the cycle must be suppressed altogether, or by means of what is called a rectifier, the alternating voltage between the high tension terminals of the transformer must be applied to the tube with unchanging polarity. In the so-called interrupterless transformer such a device is added. The principle is simple and should be clear from a consideration of Figures 11 and 12.

In these figures A and B represent heavy lead wires coming directly from the high voltage side of a transformer. Each circle represents a disc, which may be rapidly rotated and is made of some good insulating material. Attached to the disc are four projecting pieces of metal (1, 2, 3, 4), 1 and 2 being connected by a piece of wire, similarly 3 and 4. As the disc revolves, these pieces touch fixed metal brushes *(a, b, c, d)*, *a* and *b* being attached to the lead wires A and B, while by means of *c* and *d* connection may be made with a circuit containing an x-ray bulb. Suppose now, that as the disc rotates, it reaches the position indicated in Figure 11, at the moment the voltage between A and B is a maximum (the "peak" of the sinusoidal curve), A being +, B —. At that instant, then, a current will flow from A to *a* to 1 to 2 *to d*, through the bulb in direction X to Y, back to *c* to 4 to 3 to *b* to other lead wire B. Suppose further that during the time of one-half a cycle, the disc revolves to position shown in Figure 12. In that case, since the voltage between A and B is now once more a maximum, but with A — and B +, a simple inspection of the diagram in Figure 12 will show that the current flows from B to *b* to 2 to 1, through the bulb in the same direction as before to 3 to 4 to *a* to A. In other words, if the disc can be rotated at this very exact speed, then the current through the bulb will always be uni-directional. In the transformer secondary coil, of course, it is alternating just as before. This exact co-relation between the speed of the rectifying disc and the frequency of the alternating current is obtained by means of what is called a synchronous motor. Before an explanation of the principle of the synchronous motor is given it is well to note that, although the current through the tube with the above arrangement is uni-directional, it is also intermittent. A glance at Figure 13 should make it clear that when the disc is in the position indicated in that diagram, there is no current through the tube because neither *a* nor *b* touches a metal projection. Evidently the length of time the current is flowing will depend on the size of the projecting pieces, that is, on the time they are in contact with the lead wires A and B. This time interval therefore may be and probably is different in different machines. If it is very short, only the "peaks" of the voltage values will be utilized as represented graphically by the short heavy line in Figure 14 (a). If the time interval is a little longer, a greater portion of the whole range of voltage values will be utilized, the short heavy lines extending to the dotted parts. It is well to note further that, in order to utilize the peak voltage, the disc must be in proper alignment, that is, when it is in the position represented by Figure 11, the voltage across A and B must be at its maximum value. Sometimes the disc slips on its rotating axis and gets out of alignment. To readjust it the services of an electrical engineer may be necessary.

In actual practice it is found that the high tension voltage curve departs to some extent from the sinusoidal form, and indeed varies somewhat with the conditions under which the tube is being used. The effect of this on x-ray measurements will be seen later. In the meantime, while Figure 14 is more or less ideal, that in no way effects the general truth of what has been said.

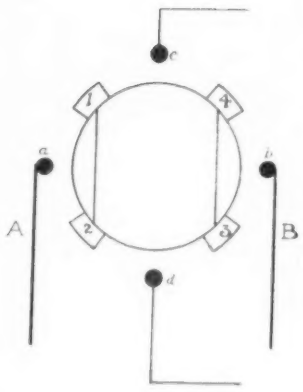


Fig 13

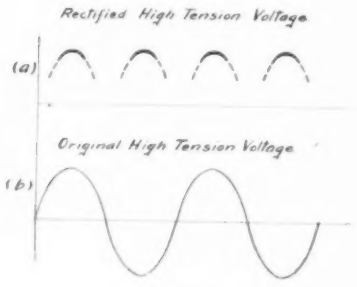


Fig 14

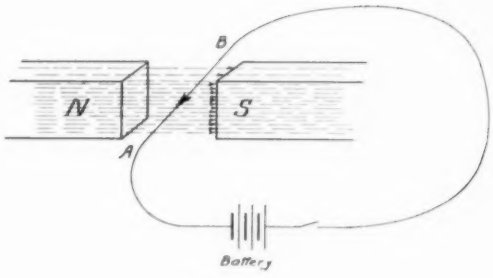


Fig 15

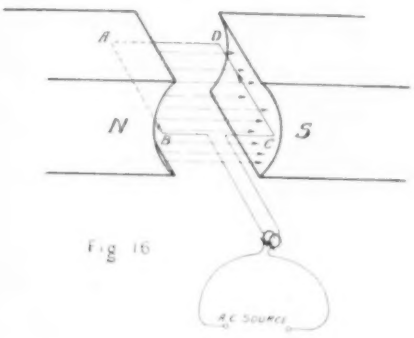


Fig 16

Fig 18

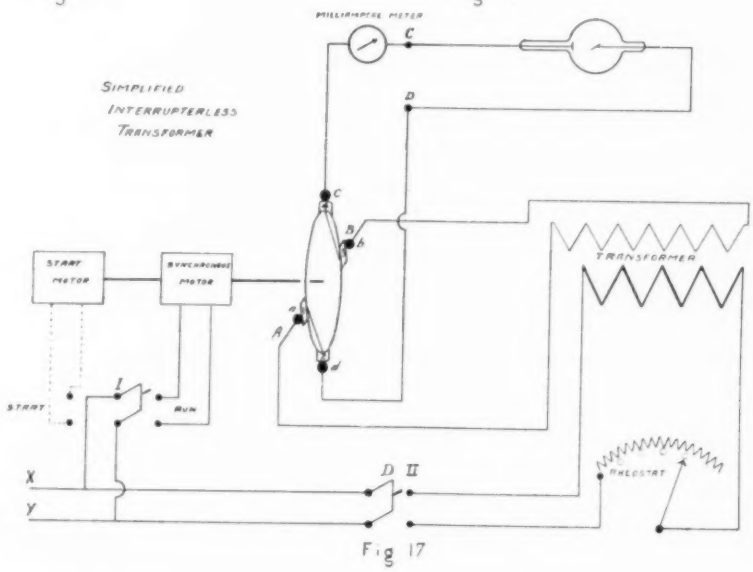


Fig 17

Fig 19

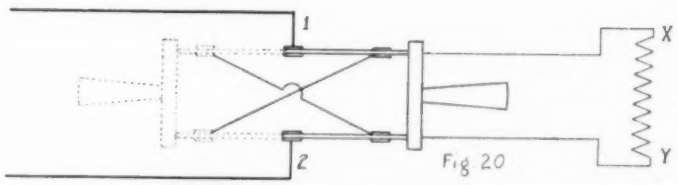


Fig 20

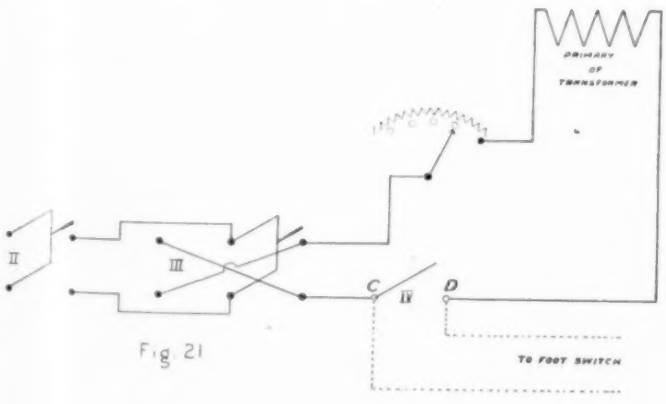


Fig 21

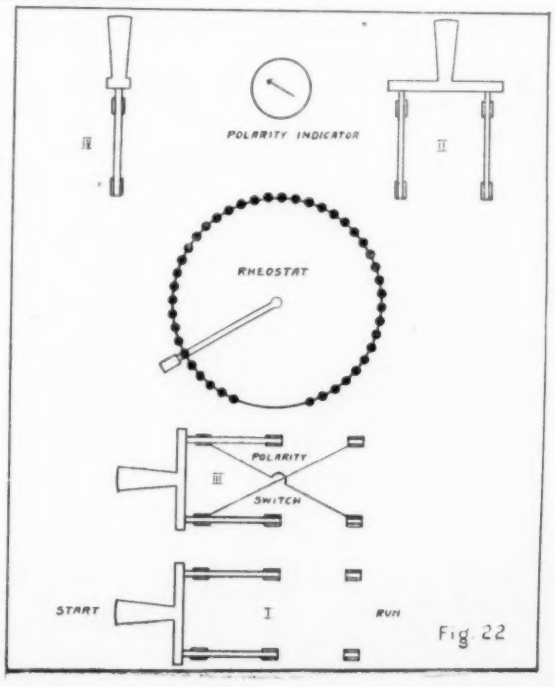


Fig 22

The Synchronous Motor

Neither radiographers nor therapists nor even physicists can be expected to be familiar with the detailed construction of synchronous or indeed other types of motors. That is the work of the electrical engineer. For any one, however, to operate an x-ray outfit intelligently it is necessary to understand the basic principles utilized in the apparatus one is handling. A simple explanation, therefore, of one type of synchronous motor will be given. As is the case with all motors, there is one fundamental underlying principle which we shall call the motor principle.

In Figure 15, AB represents a wire which is part of a circuit including a battery or some other source of voltage. If this wire lies in a magnetic field, as illustrated, and it is free to move, it will be found that on completing the circuit of which it is a part, the wire is pushed either up or down. With the current in the direction of the arrow, motion is up; with current in the opposite direction, motion is down. This simple experiment which may readily be performed, illustrates the motor principle. *Whenever a wire carrying a current lies in a magnetic field, because of the interaction between this magnetic field and that due to the current* (Sec 3) *the wire is acted on by a force.* If the wire lies at right angles to the magnetic field, as in Figure 15, it is pushed at right angles both to the lines of force and to itself; one way, for current in one sense, the opposite way for current in opposite direction. Any one familiar with the electrocardiograph apparatus will recognize the same principle utilized in the Einthoven galvanometer.

Now, let us apply this principle to a coil ABCD, free to rotate in the region between two magnet poles, and supplied with alternating current. Suppose the coil is at rest in the position shown, when the current is in the direction of the arrows. Then CD will experience a push down, AB up, and the coil will start to rotate. If, however, the current is alternating and the coil has any inertia to speak of, before it has had a chance to rotate an appreciable amount, the current will reverse, and the forces on both AB and CD will reverse also. As a consequence there will be no actual rotation. Suppose, however, that by some external means the coil is previously rotated at such a speed that it just reaches the vertical position at the moment the alternating current is passing through the zero value. This means that when the current begins to flow in the reverse sense a push on CD in the upward (reverse) sense will simply help to keep the coil rotating in the same way. Again, after another half revolution, CD will be at its highest position and ready to go down when the reversal takes place. There is, therefore, a very special speed such that a coil will keep rotating in synchronism with the changes in an alternating current. Once it is simply brought up to this speed by some external means it keeps running at exactly the same rate, because, once more, the reversals of current take place at just the right instant to cause rotation always in the same sense. In an interrupterless transformer outfit, therefore, the rectifying disc is rotated at the required exact speed by means of a synchronous motor. It is neither necessary nor advisable to discuss the practical details of its construction. We have sought only to explain the basic principle of a type in common use, and we have done so partly to show why in so many x-ray machines some device is necessary for bringing the synchronous motor up to speed. In some machines a starting motor of another type is added solely for this purpose. In others a starting switch closes a branch circuit in the synchronous motor and has the effect of making it temporarily another type of motor until it comes up to speed. In others there is a single synchronous motor built on a different principle, which comes up to speed without any external aid.

A Simplified Interrupterless Transformer

We are now in a position to consider the operation of a simplified but complete x-ray transformer outfit. In Figure 17, X and Y represent main leads, 110 or 220 A.C. The mains branch into two circuits, one supplying current to the synchronous motor, and controlled by Switch I; the other supplying current to the primary of the high tension transformer, controlled by Switch II. In addition there is the high tension circuit, including the secondary of the transformer, the x-ray tube and a milliamperemeter, with the rectifying disc placed so as to send a unidirectional current through the tube. The diagram should make clear without further explanation the connections of the tube circuit. It may be stated, however, that the parts of the rectifying arrangement are labelled as in Figures 11 and 12, and that C and D correspond to the high tension terminals usually found on the top of the x-ray cabinet which "houses" the transformer, the motor or motors, and the disc.

To operate, then, with such an arrangement, the tube is first placed in position and connected by means of extensible wires to the high tension terminals C and D. This circuit is then closed and is as illustrated in the figure. Next the synchronous motor is brought up to speed. In the arrangement we are considering, this is done by throwing Switch I to the side marked "start," thus utilizing the starting motor, until the requisite speed is attained. Switch I is then thrown to side marked "run" and left there. The rectifying disc is now running at the necessary exact speed and may be left so for some length of time. As noted above, in other types this procedure would be slightly different. In the case of some machines it is simply necessary to close a switch corresponding to Switch I above.

Finally to use the x-ray tube, Switch II, the so-called x-ray switch, is closed, thus supplying the primary of the transformer with current, and so causing an induced high voltage in the secondary, which in its turn causes a current to flow through the bulb and milliamperemeter in the closed secondary circuit. The strength of this current may be altered by putting in or taking out resistance by means of the rheostat.

Direction of Current Through the Tube

Not only must the current through an x-ray tube be uni-directional, but it must also be in the right direction. Now, if one went through the series of operations which have just been outlined, it might be found on closing Switch II that the current was going through the tube in the wrong way. Just how one would know that, will be explained later. In fact, if one began one hundred times, at the beginning, with all the switches open, it would be found that on closing the x-ray Switch II, on the average, fifty times the x-ray current would be in right direction, fifty times wrong. In other words, with the above arrangement and procedure, it is just an even chance, whether current is right or wrong. A glance at Figure 11 will explain the reason for this. In this figure it has been assumed that when the disc is in the position indicated, A is positive and B negative. Now, when it is brought up to speed, there is just as good a chance of A being negative and B positive, as vice versa. If that were the case in Figure 11, then the current through the tube would always flow from Y to X, not X to Y. With the above simplified arrangement, therefore, when the x-ray switch is closed, one would never know whether the current through the tube would be in the right or the wrong direction. If it were wrong, it would then be necessary to open the motor switch and close it again until the right direction was obtained. Now, such a procedure is decidedly bad for the tube. How, then, can it be avoided?

The Polarity Indicator

There are at least two ways, one inconvenient and seldom used; the other in constant use in connection with al-

most every interrupterless transformer on the market.

The first consists in having a "point-plane" spark gap connected to the high tension terminals, and by closing Switch II before the bulb is placed in position, allowing a spark to "jump" the gap. If the spark "jumps" as indicated in Figure 18, that is, from point to central portion of the disc, the point is positive; if the spark is as illustrated in Figure 19, from point to periphery of the disc, the point is negative. By this means the polarity of the high tension terminals on the cabinet is determined before the tube is placed in position. It should be noted, however, that every time the synchronous motor is stopped, the same procedure would have to be repeated before subsequent use of the tube.

A much more convenient method is found in the use of the polarity indicator, a small instrument found on the switch board of nearly every interrupterless transformer. The instrument is a direct current ammeter, with a pointer which moves to the left of a zero for current in one direction, to the right for current in opposite direction. It is placed in a branch circuit taken off the motor circuit and through it flows a current which has been rectified. When the synchronous motor has come up to speed, therefore, the pointer is deflected to one side or to the other, depending on which way the current has been rectified. Suppose, now, with any given outfit, it is noted once for all, when the polarity indicator needle moves to the right, which of the high tension terminals is positive. To do so the x-ray switch would have to be closed. Then subsequently whenever the polarity indicator points in the same direction, the same terminal would be positive, because each circuit is supplied from the same A.C. source.

If the polarity indicator points in the opposite direction, what then? This simply means that the high tension terminals are of opposite polarity to that previously determined. Now, practically it is convenient always to work with a tube joined to the terminals in the same way. With the arrangement we are considering, therefore, it would be necessary to keep on opening and closing the motor switch until the polarity indicator finally pointed in the desired way. This, however, is not convenient. In actual practice, therefore, another switch, the pole changer or polarity switch, this time simply a reversing switch, is placed in the primary transformer circuit. By means of this the direction of the current through the primary may be reversed at any instant. Referring to Figure 20, if at a certain moment, terminal 1 is +, 2 —, and the switch is thrown as indicated, current will flow through XY in direction X to Y; if, however, switch had been in dotted position, current would have been through XY in direction Y to X. Accordingly, when the polarity indicator points the opposite way, without opening the motor switch, it is possible to change the polarity of the high tension terminals to that desired by simply reversing the polarity switch. In some machines, the original wiring is such that, when the polarity indicator moves to the right, the correct position of the polarity switch is also to the right, and vice versa.

In Figure 21 the primary transformer circuit is re-drawn to show the polarity switch (III.) as well as the way in which a foot switch is used.

The Foot Switch

Sometimes an operator may need the use of both hands and it is then convenient to be able to operate the tube by one's foot. When this is the case, the transformer primary line is broken at any convenient place (C and D, Figure 21) and two wires are lead from each side of the break to a switch (not shown), the two parts of which may be pressed together by means of the foot. If one does not wish to use the foot switch, it is necessary simply to close a small single knife switch (IV, Figure 21), connecting C and D. If it desired to use the foot switch, then first of all Switch IV must be left open, x-ray Switch II must be left closed, while finally the tube is operated by closing the transformer circuit with the foot switch.

In actual practice, for convenience, the various switches and controls are usually all placed on a common switch-board. Figure 22 is a diagram of the appearance such a switch board might have to correspond to the type of outfit we have been considering.

EDITORIAL

The JOURNAL OF RADIOLOGY

A Journal of ideas and ideals.

Published monthly at Omaha, Nebraska, by the Radiological Publishing Company for The Radiological Society of North America.

Subscriptions—In the United States, its possessions and Mexico, $5.00 yearly; Canada, $5.50; elsewhere, $6.50 the year.

Advertising rates on application. All advertising must conform to American Medical Association Rules.

Payments for subscriptions and advertising must be made to Radiological Publishing Co., in New York or Chicago Exchange.

Address all communications to Business Office, 305 Arthur Building, Omaha, Nebraska.

Some Organization Problems and Possibilities*

THIS SOCIETY is our witness that we believe in organization of radiologists, and it may be conceded that the more comprehensive this organization is, the more effective it will be in its work. It may appear presumptuous for a comparatively unknown member of the society to attempt a discussion of its work and the direction in which its energies should be expended. My excuse is that some critical study has been given the subject and that a discussion of our problems appears timely.

Although not so worded in our constitution, our main objects can be covered by three headings:

I.—Scientific: To develop and advance the science of radiology.

II.—Organization: To perfect a closer association of the men and women practicing, or interested in radiology.

III.—Propaganda: To establish and maintain the practice of radiology as a specialized branch of medicine.

Scientific

The four objects of the Radiological Society, as stated by its constitution, look almost entirely toward the development and refinement of radiology as a science. Radiologic research, the providing of meetings, the publishing of our journal, the maintenance of library and museum, are all phases of one idea, concerned with self-centering of our energies. By virtue of this centripetal force, concentrating our influence within narrow bounds, naturally we have made great strides in one direction and may justly be proud of our scientific achievements of the past few years. Yet, self-improvement in the practice of radiology, for the individual, is the least important of the goals toward which this society, as a body, should direct its organized activity. Not because it is of minor importance that radiology as an art should advance, but because the other two objects hold greater opportunity for us, as a society, to attain our destiny. Radiologic science will advance through the initiative of the individual and we can have very little effect upon that advance; our business, in this connection, should be to gather up and present, at our meetings and through our journal, the achievements of the individuals. To devote a large portion of our resources to experimental or research work, for example, is an unwise distribution of energy. A small stream of water is lost when it empties into a large river, but it will bring wonderful returns if diverted and used to irrigate the desert.

Organization

Neither the Radiological Society nor the American Roentgen Ray Society states, as one of its objects, the development of a closer association of the men and women engaged in the practice of the specialty. Although this society has been very active in enlarging its membership and has made a remarkable showing in that respect, it must be assumed that this membership campaign is a secondary consideration, since it is not included among the primary objects of our society. In securing new members, through our state councillors, the principal object should be, not to add the prestige of well known names to our roll, nor to secure financial returns from a large membership, but to perfect a comprehensive and inclusive association of the radiologists of North America.

It is conservatively estimated that there are, in the United States and Canada, about 2,000 doctors interested in radiology as a medical specialty, which means that our society is less than fifty per cent efficient in organization. We can, with good reason, be proud of the work of our state councillors in bringing into our membership nearly fifty per cent of the radiologists of the country, within five years. It is a marvellous achievement, and such an efficient machine must not now be permitted to idle, but must be enlarged and prepared for the greater work ahead, which a view of some typical sections of the country will illustrate. In Massachusetts we have 19 members out of 75 radiologists; in New York 48 out of 154; in New Jersey 13 out of 35; in Pennsylvania 32 out of 122; in a group of southern states 31 out of 75; in Ohio 56 out of 87; in Indiana 29 out of 45; in Wisconsin 20 out of 31; in Texas 19 out of 56; in Oklahoma 9 out of 18; in California 34 out of 64. Although these figures include this year's applicants, they do not, by any means, adequately represent the field which needs to be organized, for radiology is developing more rapidly than ever before and men are entering the specialty by scores, and perhaps hundreds, each year. We cannot, and must not, ignore these new radiologists, since they will be the leaders ten years hence. They must be cultivated as soon as they enter the specialty, for two very excellent reasons: (1) that their allegiance and cooperation may be won for organization work; (2) that their first efforts and their development into specialists may be rightly directed.

There is some tendency to the idea that we have organized as a defensive move against the practitioners who would like to become radiologists and who are advancing gradually toward that worthy ambition. Such an attitude on our part should be unreservedly condemned. This country needs many more radiologists, not so much in the larger cities as in communities of moderate size. This need can best be supplied by the general practitioners who make the transition gradually from general work to radiology, and there should be a highly developed department of our organization which will seek out and encourage the men who are entering the specialty from the ranks of general medicine. In a medium sized community from 10,000 to 50,000, it is not essential that a radiologist devote all his time to the specialty. The College of Surgeons developed the right idea when they laid down their qualifications for a recognizable surgeon, these providing that the ratio of surgery to the

*—Read before the Annual Meeting of the Radiological Society of North America, at Detroit, December 4-8, 1922.

total work of the doctor might grade down in proportion to the size of the community in which he practices. As long as our society is proud to accept as members, eminent dermatologists, surgeons, internists, eye, ear, nose and throat specialists, orthopedists, gynecologists, who use radiology merely as an adjunct to their work, we should not cavil at the general practitioner in a small city, who is conscientiously trying to supply the demands of his community for reliable x-ray work.

One problem, whose solution is possible, is the securing of adequate information as a basis for organization activity. This can be done by a properly developed Bureau of Information, which should gather data not only about all established radiologists, but also about those who are, as yet, only in the transition stage. The following rough figures will illustrate the need for such information. There are, in the United States and Canada, at least 815 cities with populations over 10,000. There are 237 communities of more than 10,000 population without a radiologist registered in the A. M. A. Directory; in these 237 communities there are more than 300 hospitals of more than 50 bed capacity. These figures take no account of cities which list even one radiologist, and since many hospitals in large cities have no radiologist, there are certainly many more than 300 hospitals of more than 50 beds without qualified radiologists. The information desirable should embrace the following, at least:

(a) Name of every radiologist now practicing in the United States or Canada, his qualifications and his hospital connections.

(b) List of all hospitals in the county, their size and type of organization; their x-ray equipment and method of conducting x-ray departments.

(c) The number of doctors in each community of more than 10,000, and the general nature of the medical or surgical work of the community.

(d) The demand for radiologic facilities in each of these communities and how this demand is being met.

(e) Names and locations of all men doing radiologic work and not connected with hospitals, together with the general attitude of the medical profession of their communities toward radiology as a medical specialty.

With this information in hand, the central organization can intelligently and effectively assist the various state councillors in propaganda and educational work.

Propaganda

With regard to these actual and potential radiologists, let us visualize a definite policy of education and cooperation, endeavoring to see that they receive the support of their confreres and that their work is recognized and developed. An excellent pprecedent for this type of propaganda is to be found in the work of the late Dr. McCormack, for the American Medical Association, and a bit of history which developed from his activities is given to illustrate this point. Some ten or twelve years ago, he visited a western city, cultivated the acquaintance of the doctors during several days and then addressed the county medical society. He emphasized the advantages of cooperation, of study, of postgraduate work, of specializing when the community demands it, finally suggesting that some young doctor be encouraged to engage in clinical laboratory work, a most evident need in that community. This advice resulted in a doctor who was an indifferent success as a general practitioner, taking up first the clinical laboratory work and, later, the x-ray work for the community. Through the legitimate demands of the profession, created by persistent and perfectly ethical educational propaganda, large laboratories for these two specialties have developed, and all independent x-ray machines have been discarded in that city. Of more importance, when the hospital tried to follow the recommendation of the College of Surgeons and operate a newly installed x-ray department with a "trained technician," the staff surgeons refused to cooperate until the x-ray work was placed under a consulting radiologist. This bit of history is given solely to illustrate three things which are problems of our propaganda work; (1) the successful development of high-class radiology in a small community; (b) the education of the doctors to cooperate with the radiologist and support him whenever he convinces them of the superiority of his work and agrees to furnish the service at a financial saving to them; (3) the instillation of the knowledge into the general profession and hospital managements that radiology is not a technical affair, but a specialized branch of clinical medicine.

The successful solution of the problem involving the development and maintenance of radiology as a medical specialty lies in education of the medical profession. It is not to be solved by resolutions and conferences among ourselves. It has no reference to the attitude of the individual radiologist toward his own work. It is taken for granted that every radiologist regards himself as a medical specialist and insists on performing his work as a consultant. What is needed is to bring the general profession to the realization that the interpretation of pathology, and not technical procedure, constitutes the work of the radiologist; that such interpretation requires a high degree of medical knowledge. There is no idea, here, of criticising the physician or surgeon who uses an x-ray technician for mechanical and technical details while he, himself, makes the interpretations from x-ray shadows or prescribes his x-ray treatments. Such a man is no more to be criticised than is the general practitioner who performs his own surgery, and often does it well. The situation regarding which we have just grievance is created by the attitude of our great medical and surgical organizations, their ideas being reflected in the general professional body.

In one of the large mining camps of Arizona, some years ago, before the medical examining board came into existence, there was a mulatto "doctor" in charge of the mining hospital, conducting its medical and surgical work. At one of the medical banquets of those pre-Volstead days, this man, with alcoholic candor, admitted that his entire medical training consisted in acting as a coachman for an eastern surgeon during several years; he held his position as mine surgeon by calling in consultants for difficult cases. This bizarre frontier experience is past history with us and could not now be repeated, but in many sections of the country, conditions exactly similar are taken as a matter of course. In Chicago, for example, non-medical men are permitted to take charge of important hospital departments and these laymen are called in consultation by eminent clinicians and surgeons of that city, which aspires to be the medical hub of the world. We learn, in the case of one so-called "radiographer" with important hospital connections, that his medical education was acquired by acting as janitor in an x-ray laboratory. Wherein is this any improvement over the negro coachman acting as a surgeon? The fundamental medical knowledge necessary to make a proper x-ray examination of the abdomen and give a correct interpretation of gastro-intestinal pathology, is as great as the skill required to remove the appendix surgically. It is reported that a famous Chicago surgeon, now dead, had in his surgical laboratory, an attendant who could perform any requested operation, with a celerity and skill which was the wonder of all visiting surgeons. Had he, because of this technical ability, tried to practice surgery, he would promptly have landed in jail. Yet, such a man's right to practice surgery is, in every respect, equal to the right of laymen to diagnose and treat diseases with x-ray. Further, to refer patients to

this knife wielder would be no more reprehensible than to send them to the operator of the x-ray machine.

There is a very striking inconsistency in the attitude of great medical organizations toward the relationship between radiologists and lay radiographers, as compared with their attitude toward exactly similar relationships in other specialties, e. g., those between the ophthalmologists and opticians. The American Medical Association has been avowedly, and properly, against the practice of medicine by opticians, but has actually lent encouragement to the practice of medicine by x-ray photographers. A non-medical man practicing radiology bears exactly the same relation to medicine as does the optician who diagnoses and treats eye diseases. The only difference is that the optician usually has had good training and confines his work to a limited field, while the radiographer, with no medical training at all, covers the whole range of clinical medicine. The opticians are outlawed by all medical organizations, doctors who refer patients to them are censured; hospitals are closed to opticians; they cannot advertise in medical journals, and their efforts to secure legal recognition are always opposed by medical organizations. On the other hand, the x-ray photographers are given charge of hospital departments with the approval of dignified medical bodies; they operate laboratories for the diagnosis and treatment of disease; they advertise in state medical journals whose pages are vised by the American Medical Association; in one state, when they sought legal recognition, they were actively supported by the state medical society, which assisted them to form an organization, invited them to hold a sectional program at the annual society meeting, and took them into the official medical body *as associate members*. A bitter fight on the part of the radiologists of the state finally forced the society to rescind their action, in part, but even today, the officials of that medical body do not admit that they were in the wrong.

One of the requirements of the Minimum Standard for Class A hospitals is that there shall be an x-ray department equipped for diagnosis. The nature of this equipment is not specified, except that the department is not required to have a medical head—a "trained technician" being considered sufficient. The clinical laboratory is required to have a pathologist in consultation, because tissue pathology requires a medically trained eye, whereas, presumably, gross pathology as shown by the x-ray film, does not. This idea of an eminent surgical organization has good legal support, since the supreme court of Iowa has said that an x-ray film brought into court, does not need to be interpreted by an expert; it shall be submitted to the jury without comment, because, in the words of the judge—"an x-ray photograph carries with it its own interpretation."

Can we ever hope to overcome so universal a misconception of what constitutes the practice of radiology? It is believed that we can, but not without considerable work, the first step in which is to visualize the task. That task is to educate the medical profession, to permeate it thoroughly with the idea that radiology is as much a medical specialty as surgery or obstetrics. The place which our work holds in the estimation of the profession is due, purely, to lack of correct information. We can trust our profession to act justly, when it is correctly informed.

One of the definite things which we can do is to see that every medical society in the country, large or small, whenever it meets, shall have a representative from this society presenting the facts of radiology. Not only in scientific meetings, but in organization conferences, we should have spokesmen and delegates, leaving always the definite impression of the significance, importance and dignity of radiology as a medical specialty. This type of work cannot be safely left to individual initiative, but should be a department of our organized activity. Whenever there is a radiologic section of a larger medical organization, every member of that section should exert a weighty influence in sectional meetings. It is questionable whether radiologic sections of general societies are advisable, at the present time, since they are likely to self center our work. It is much better, from the educational angle, for us to make presentations before other sections, and we should see that they always have worthy papers on radiology.

We should continue and intensify our efforts to secure, through the College of Surgeons and other interested organizations, a recognition of the necessity for having the x-ray departments in charge of medical radiologists. It is, of course, not necessary or desirable that the technical work of making films be personally done by the radiologist, any more than it is necessary that the surgeon be required to shave and scrub his patients before operating them. But, whenever a diagnostic interpretation is to be made, or an x-ray treatment outlined, a physician trained in radiology should be called on for such diagnosis or prescription. Such a standard, set by the College of Surgeons, supplemented by this and other special societies, could be met, in small communities not now supplied with a radiologist, by encouraging some local practitioner to make the necessary study of the subject which will entitle him to speak with an authority above that of his confreres in x-ray interpretation, thereby giving him charge of the consultation work for his hospital and community. Frequently this can be done by combining the x-ray and clinical laboratory departments under one head. It is no wild dream to imagine this society sending a representative, following the example of Dr. McCormack, or the present-day representatives of the College of Surgeons, to lecture the hospital staff about the proper relationship of radiological work to other medical and surgical work, and even to induct some practitioner of the community into the specialty. Along this same line, it seems that some of the resources of the organization could well be employed in establishing and conducting a school of instruction for medical men who desire to secure sufficient training to handle the x-ray work of small communities. The technical principles and essentials of interpretation could be given in a short time. This sounds treasonable in the face of the teaching that it requires from one to three years to make a radiologist. It is not contemplated that a finished radiologist will be turned out in a month, but that sufficient foundation can be laid in this time to enable an intelligent general practitioner to follow up the work in his own practice.

This discussion is presented to this body because it is not good for us to become too satisfied with our organization. Our society has grown rapidly and is destined to become a power in medical affairs in this country, but a *laisser faire* attitude at this time would be a calamity. Not until we have comprehensively organized the radiologists of the entire country, not until we have brought the profession to a thorough realization that radiology is practicing medicine as a specialty, and have the weight of the general medical organizations solidly behind that idea, can we safely relax our efforts. The study of radiology as a science and art has, heretofore, claimed a disproportionate share of our attention, and it is now time for us to direct our chief efforts into other essential lines of development.

W. WARNER WATKINS, M.D., F.A.C.P.

European Visitors

THE following guests from European countries were present at the Annual Meeting of the Radiological Society recently held in Detroit. We were greatly pleased to have these men with us and extend to them a most cordial invita-

tion to soon come again: Dr. O. Glasser, Freiburg, Germany; Dr. Hector Paul Pilon, Paris; Dr. John Iten, Berne, and Dr. Ernest Pohle, Frankfort a.M., Germany.

American Roentgen Ray Society

THE mid-winter meeting of the Central Section of the American Roentgen Ray Society will be held in Louisville, Kentucky, February 24, 1923. A splendid program and attendance is planned by those in charge and visitors from other sections of the country will be welcomed as well.

Mid-Annual Meeting

THE Mid-Annual meeting of the Radiological Society of North America will be held in San Francisco, June 22 and 23. The hotel headquarters will be at the Palace, and the meeting will be held in the Civic Auditorium.

CASE REPORTS

Gastric Polypus and X-Ray Demonstration of the Same

J. P. McCULLOUGH, M. D.
Pittsburgh

THE malignant tumors occupy such a prominent position in the study of tumors of the stomach that the study of benign tumors appears to be neglected. This is largely due to the relative infrequency of occurrence of the latter.

Benign growths of the stomach have been classified as polypi, adenomata, lymphoadenomata, myomata, fibromata, myxomata, lipomata, osteomata and cysts; from a pathological and from a surgical standpoint some of the most interesting features of these benign tumors are associated with polypoid growths.

In a review of the literature on benign gastric tumors, Campbell in 1914 mentions the frequency as reported by Tilger to be 14 in 3500 autopsies. He quotes another writer as reporting four gastric polyps in 7500 necropsies. While Basch in 1915 mentions Ebstein's findings to be 14 gastric polyps in 600 necropsies. Thus, there appears to be considerable difference of opinion as to the frequency of occurrence of the benign gastric tumors, particularly polyps.

In 1914 Campbell made the following statement: "It is interesting to note that the diagnosis of benign tumors has rarely, if ever, been made before operation." Campbell at that time emphasized the fact that the rapid development of radiological diagnosis promised to be more valuable in the diagnosis of these tumors than any other means short of acual demonstration of the growth itself.

In 1914 Stoner presented an article, reporting a case and mentioning the fact that the ages of two patients whose cases had come under his observation were 34 and 36 years, the youngest patients reported with benign tumors up to 1914.

The following year, 1915, Basch reported three cases as follows: The first case was seen in 1912. In this case the x-ray examination revealed a defect suggestive of tumor which after removal proved to be a papillary adenoma. The defect noted was a persistent knob-like projection into the lumen from the middle of the greater curvature. In the second case the radiogram showed a large circular defect at the junction of the pyloric antrum and pars media, the defect was characterized by a mottled appearance such as Myer described in a case of polyposis in 1912. Operation revealed a pedunculated mass two and one-half inches in diameter, not far from the pylorus. The radiogram of the third case showed defects resembling finger prints in the region of the pyloric antrum. This case proved to be a papilloadenoma.

Since 1915 the development of radiological diagnosis has been rapid and the report of cases of polypoid tumor before operation should be less infrequent than formerly.

Of the classification mentioned above mucous and adenomatous polypoid growths are probably found more frequently than the others. They resemble each other very much in structure; true adenomata being made up of more or less tortuous, dilated, tubular glands, supported by connective tissue and well supplied with blood vessels. They form rather firm smooth rounded or somewhat lobulated tumors, occasionally cystic in part, the cyst being filled with mucous. The size ranges from that of a walnut to that of a fetal head.

Menetrier in 1888 described two form of adenomata, and his description is frequently referred to as presenting the most accepted classification. He described a superficial form, involving the execretory ducts and associated with lobulation, and a deeper form involving the glandular structures and presenting little or no lobulation. When they occur singly as a solitary polyp or multiple polypi, he applied the term "polyadenomes polypeau," and where they occur en masse, the term "polyadenomes en nappe" is used.

Ruggles in a report of a case in 1917 stated that only four cases of polyposis (polyadenomes en nappe) had been reported since Menetrier's article in 1888. Carman has seen two cases of polyposis in 50,000 examinations.

Balfour reported in 1918 a case of polyposis, which corresponds to the "polyademomes en nappe" of Menetrier, and he expressed the opinion that polyposis is a separate entity from single polyp.

In 1920 Novak of Johns Hopkins reported a polypoid adenoma removed

*—Read at the Annual Meeting of the Radiological Society of North America, Detroit, December 4-8, 1922.

by gastrotomy during an operation for cholecystitis, at which time palpation of the stomach revealed a small mass there. The sketches presented in Novak's article demonstrate the operative findings in the case, which furnished the incentive for this review of literature with one exception; namely, that the writer's case presented a tumor considerably smaller than that of Novak, its location and other characteristics resembling Novak's case.

Of the more recent articles published discussing polypoid growths within the stomach is one by Merrill in the Boston Medical and Surgical Journal, February 17, 1921, and another by Eusterman and Sentry in Surgery, Genecology and Obstetrics, January, 1922.

Merrill here presents a case of polypoid adenoma in which the x-ray examination revealed a rounded, slightly mottled shadow displacing the barium contents without completely filling the gastric lumen. It presented no interference with peristalsis, and there was no impairment of flexibility of the gastric wall. The tumor was superficially lobulated, giving the x-ray shadow a reticulated appearance. Hemorrhage was apparent as one of the clinical symptoms.

From the fact that most of the cases which have been reported previous to 1914-15 have been found accidently during operation for other conditions within the abdomen or at autopsy, there is no doubt that many cases have passed unrecognized and not observed because of lack of operative or postmortem findings. Many of the cases reported within the last six or eight years have been brought to the attention of the surgeon by x-ray examination.

The occurrence of polypi is noticeably infrequent, and from the study of the literature and reports of cases, no definite etiological factor seems apprarent. Basch states that the causes assigned include chronic alcoholism, chronic gastritis and atheroma of gastric vessels. Carman says that there is nothing in the clinical or physical examination of his cases which would establish a diagnosis or differentiate them from other organic or functional diseases of the stomach. The three cases reported by Basch presented no symptoms which could be considered characteristic. Signs and symptoms common to all gastric disturbances and pathognomonic of none in particular seem to be present in the symptomatology of cases reported.

In simple pedunculated growths the symptoms seem to be of less consequence than those of the polypoid mass formation. The growths may be present throughout life and give rise to no symptoms, and they have been discovered often at operation, sometimes accidently when operation was performed for other disorders. On the other hand their presence may be frought with great danger to health and life. A polyp located near the pylorus and having a long pedicle is apt to prolapse into the pylorus and be associated with pain, nausea and vomiting. Such obstruction is said to be intermittent with intervals of good health between attacks.

A natural cure may result by separation of the polypus from its pedicle through torsion or strangulation of the latter. It may, on the other hand, result in prolapse of the gastric wall into the duodenum, producing gastro-duodenal intussusception. Such a case was reported by Wade in 1913.

Hemmorhage is a very important condition which may result. Miller, quoting Fenwich on "Cancer and Other Gastric Tumors," states that in ten per cent of all gastric tumors there is hemorrhage and that it may be serious. He says also that an important fact in connection with adenomata is that pathologists generally admit that adenomata have a close association with malignancy.

Miller summarized the study of his case of polypoid carcinoma as presenting the following interesting features:

1. The occurrence of an anemia (eighteen months before the patient's death) of such a degree as to suggest primary pernicious anemia and which was probably dependent upon hemorrhage from a primary benign lesion.

2. The probability that malignant change was secondary to a benign tumor.

3. The polypoid nature of the tumor without evidence of involvement of the deeper structures of the wall and yet unquestionable metastasis.

Here is a case which appears to have been a benign polypoid growth, which gave rise to serious hemorrhage and showed malignant degeneration and metastasis without involvement of the gastric wall. The x-ray evidence in this case is described by Pancoast as a permanent defect in the dependent portion of the greater curvature of the stomach. The x-ray report further states that the gastric lesion was probably a papilloma, although he suggests the possibility of carcinoma or sarcoma.

The following case came under the observation of the writer in 1920: A woman, age 23. Personal history: She had had typhoid when 4 years of age, measles and chicken pox in childhood, and in the early part of 1920 had had a mild attack of influenza. The chief complaint at the time of examination was pain under the right shoulder and pain in the right iliac fossa, the pain radiating from the epigastrium. The pain under the right shoulder was most annoying before arising, usually about 5 or 6 a. m., the pain in the epigastrium most severe in the morning. No pain during the day. No nausea, no vomiting. Pain had no relation to eating. Pain in the right iliac region was rather indefinite and rather infrequent in occurrence.

X-ray examination of the stomach revealed a rounded defect in the stomach shadow about one to one-half centimeter in diameter, located in the pyloric region near the lesser curvature and just distal to the angularis portion of the lesser curvature. There was no impairment of peristalsis nor any interference with the flexibility of the gastric wall. No interference with the emptying of the gastric contents into the duodenum. The stomach emptied in four and one-half hours. No evidence of intestinal or colon pathology. The appendix was rather long, freely movable and showed no evidence of pathology. X-ray diagnosis was gastric polyp.

Operation: Appendectomy and gastrotomy. The tumor and its pedicle were removed, and presented the following appearance. A small almost round ball of tissue measuring one and one-half by one centimeter, fairly firm, beefy in color. The surface had a cauliflower like appearance, the pedicle measured two centimeters in length and was three millimeters in diameter.

Section of the growth showed a thin central fibrous core, carrying small blood vessels, and from the core radiated strands of tissue like spokes of a wheel. These strands were pinkish gray in color, cellular and moist.

Microscopic examination showed the strands of radiating tissues to be glands considerably hypertrophied in which there was hyperplasia of epithelium. The tumor mass presented a similar tissue appearance under the microscope. Some of the glands had a cystic appearance and contained mucous. There was considerable round cell infiltration. Pathological report: Mucous polypus.

Reviewing the x-ray appearances produced by benign growths, particularly those pedunculated, it is noted that a defect in the gastric shadow is usually present. This defect varies in appearance apparently according to the size of the mass, its location and the length of the pedicle.

In cases of polyposis the polypoid masses present a diffuse mottling due to displacement of barium by these

masses and giving a reticulated or honeycombed appearance. The size of such an area being dependent upon the extent of involvement.

In the single polypoid growths the x-ray appearance varies from finger-print defects to rounded, sharply outlined defects, which may or may not show a mottled appearance accordingly as the surface of the growth is nodular or smooth, as in the cases cited by Basch. On the other hand, the defect may by virtue of an irregular outline or lobular surface present a correspondingly irregular outline defect.

On account of the small surface of involvement from a small pedicle attachment permitting of free peristaltic action and because of no impairment of gastric wall flexibility, also from the fact that pedunculated masses have a certain degree of movement within the stomach, they resemble the appearance of retained food material or foreign bodies and care must be exercised to differentiate in this respect.

The dangers of gastric polyp, particularly those of mechanical production, hemorrhage, and possible malignant degeneration make the early recognition of these conditions imperative.

The x-ray offers the best means of early diagnosis of gastric tumors, pedunculated or otherwise.

References

Balfour, D. C.: Polyposis of the stomach, Surg. Gynec. Obst., 28:465, May, 1919.

Basch, S.: Primary benign growths of the stomach, Surg. Gynec. Obst., 22:165, Feb., 1916.

Carman, R. D.: Roentgen diagnosis of the alimentary tract, 1922, W. B. Saunders Co., Philadelphia.

Campbell, A. M.: Benign tumors of the stomach, Surg. Gynec. Obst., 20:66, January, 1915.

Mentrier, P.: Gastric polyadenomas and their resemblances to gastric cancer, Arch. de physiol. norm. et path., 1:32, 1888.

Miller, T. G.: Polypoid carcinoma of the stomach, J.A.M.A., 76:229, January 22, 1921.

Myer, Jesse: Tr. Sect. Gastro-Enterol., A.M.A., 1913.

Novak, E.: Polypoid adenoma of the stomach, J.A.M.A., 74:871, March 27, 1920.

Pendergrast, E. P. *and* Pancoast, H. K.: A case of pedunculated adenocarcinoma of the stomach and possible errors in diagnosis, Am. J. Roentgenol., 7:602, December, 1920.

Stoner, W. C.: Polypoid adenoma of the stomach, Ohio State M.J., 10: 727, December, 1914.

Wegele, C.: Polyposis of the stomach, Mitt. a.d. Grenzgeb. d. Med. u. Chir., 19:53, 1908; abstracted J.A.M.A., 51:448, August 1, 1908.

Healed Renal Tuberculosis

C. C. BIRKELO, M. D.
Detroit

ONE of the cases here recorded is the first case of its kind ever published, as far as we are able to find out from the literature. The others, although they represent various anatomical locations, are also sufficiently interesting and rare to justify this report. Each case is briefly outlined because each is self-explanatory.

Healed Renal Tuberculosis

We lack proof that renal tuberculosis has even healed, but it is because we believe this case represents a healed renal tuberculosis that we report it.

Brasch speaks of autonephrectomy causing a possible healing. Chute believes that many small renal tuberculous lesions heal in the kidneys as elsewhere and escape unnoticed; however, we lack the evidence which would prove this view.

Case 1. Male, age about 55. Came to the laboratory for blood sugar determination, and the doctor requested that we fluoroscope patient to see if there was any fluid in the chest. While doing this we observed a shadow resembling a kidney in the left abdomen and a single roentgenogram was made, which showed diffuse calcification of the kidney.

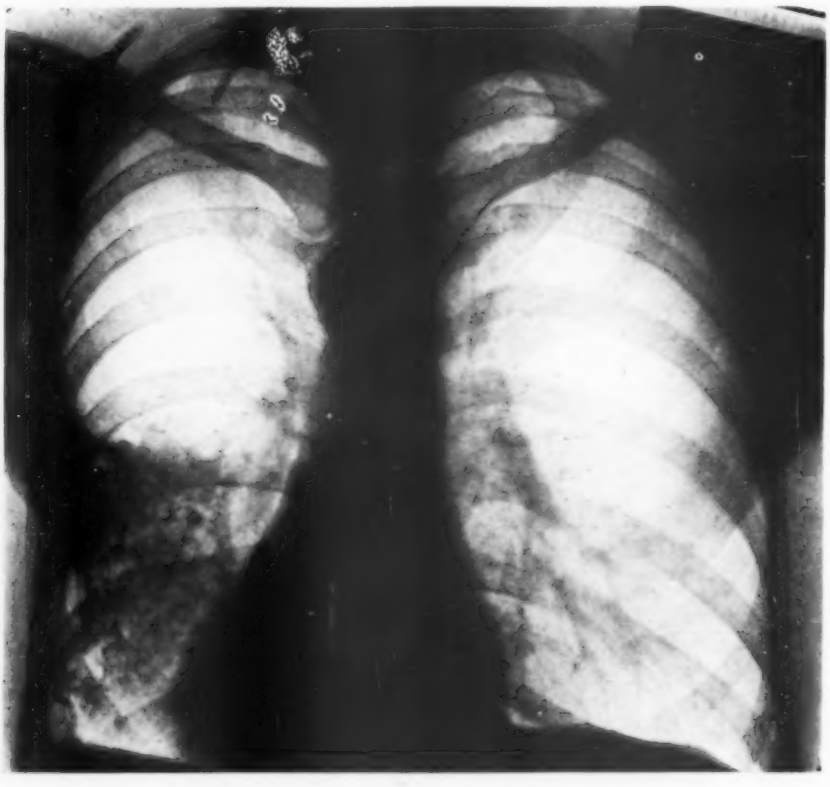
About one month previous to this examination the patient had been operated on for an acute appendical infection and an abscess was found about the appendix. An ascending infection set in involving the pancreas and large amounts of sugar had appeared in the urine. It was for this condition that examination of blood sugar was made at the laboratory, when we accidentally discovered this diffuse calcification in the left kidney. Any further attempt at examination of this patient was refused, and he also refused further treatment of his diabetic condition. He attempted to return to England, but died in coma on the way.

This patient gave no history of hematuria or pains in the region of either

kidney and had apparently enjoyed good health except at the age of 12, when he had been sick for about a year, when it was thought that he had kidney disease. He had had no known recurrence of this condition since then, nor did he remember any pain in the left abdomen. There was no mistake about the diagnosis of appendicitis, as an abscess was found, and it was following this that sugar appeared in the urine. From this history it appears that the process must have started at the age of 12, and as it gave no further symptoms for the next forty years, we think it would be only reasonable to consider the process healed.

Calcification of the Visceral Pleura

Case 2. We have here a case of diffuse calcification of the pleura with no history of any tuberculous infection in the lung, but a diagnosis of tuberculous peritonitis has been made and we find calcareous deposits below the diaphragm on the same side as the calcified pleura. We believe it is the result of a tuberculous infection, and if so, both must have healed, because patient is free from both pulmonary and abdominal symptoms and has been for the last two or three years.



History: Mr. L. A. P. Age, 41. Family history, negative. The patient had a severe attack of pneumonia at the age of 7 and remained in poor health for three years. Six months in the woods of the northwest seemed to make a change for the better and he began to grow. Since then he has had no lung trouble until three years ago, when he had a light attack of the "flu." At the age of 28, however, he had typhoid fever, which he states was followed by jaundice and abdominal pains, which were diagnosed as due to tuberculous peritonitis. He has had slight digestive disturbances on occasions. We made a gastro-intestinal study on this patient about two years ago and this was negative except that it showed a few calcareous deposits below the left diaphragm which led to the discovery of the calcification in the pleura. Stereoscopic roentgenograms show dense calcium deposits in the pleura over nearly the entire lower left lobe, outlining definitely the pleura and showing that it has retracted from the chest wall.

There is no evidence of any tuberculous process in either lung, and, therefore, the calciferous condition in the pleura must have been the consequence of an old pleurisy possibly secondary to a tuberculous peritonitis.

DEPARTMENT of TECHNIQUE

An Aluminum Cassette For Use in Pfahler's Method of Examination of Sphenoid Sinuses

JOSEPH ASPRAY, M. D.
Spokane

I HAVE FOUND the vertical method of examination of the posterior ethmoids and anterior portion of the sphenoids very valuable. An aluminum cassette to hold film and screens makes the method comparatively easy.

The cassette is made of thin aluminum 3/8" by 2¾" by 5", the front end being rounded, and the other end is open. A piece of cardboard is made to fit this cassette and protrudes from the open end about an inch.

Before placing the cardboard in the cassette a flap of orange paper is fastened about three and one-half inches from the inside end. We have two intensifying screens, one of which is fastened to the cardboard and the other to the flap. The duplitized film cut to fit, is placed between the screens and the entire filling is placed in the cassette with cardboard on the bottom. A lead letter "R" is fastened to aluminum top on right.

This cassette, properly loaded, is placed as far back as possible in the mouth, the patient breathing through the mouth. Out of over a hundred cases we have yet failed to see the patient who would not tolerate it.

Have patient lie upon the back on a four inch hard pillow, head straight, with a three inch cone centered so that the edge of the cone is near the head, and on a level with the anterior portion of forehead. The technique used on cassette, in the position used when is as follows: 90 degree angle, 4½ inch spark, 25 ma., 2½ to 3 seconds exposure.

Posterior-anterior-oblique Examination of Sphenoid Sinuses

FOR the past year and a half I have been using the following methods in the examination of the sphenoid sinuses, along with the usual lateral and vertical methods.

The patient is placed with forehead radiographing the frontals. The tube is angled upward ten degrees, a three inch cone is used and this is centered over the foramen magnum. Our technique with double screen is 4½ inch spark, 25 ma. and 5 seconds.

This will throw the sphenoid superimposed upon the frontals, and in the majority of cases shows the sphenoid sharply outlined. The size of each side and the densities can be definitely judged.

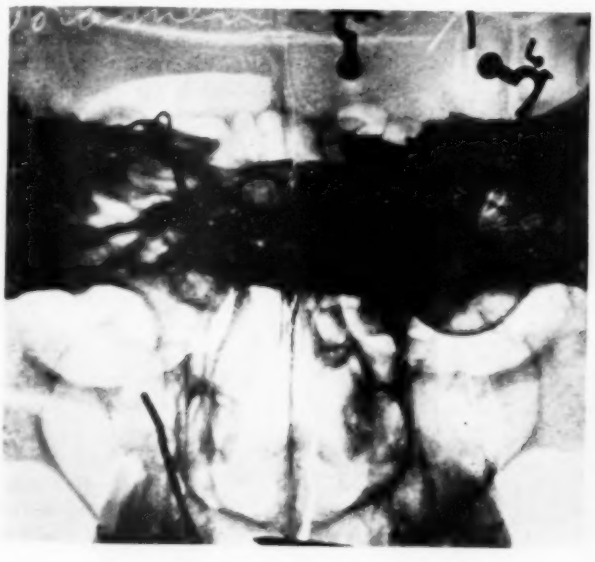


Fig. 1—Sphenoids of different densities.

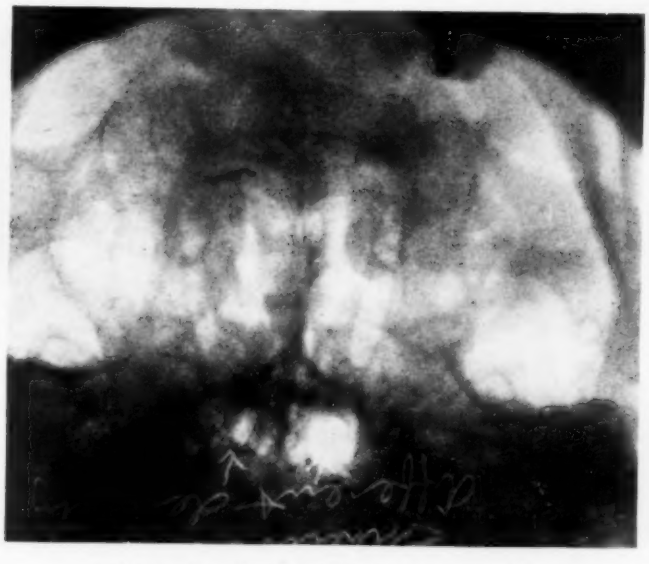


Fig. 2—One side of sphenoid filled with lead. Lead ring around foramen magnum.

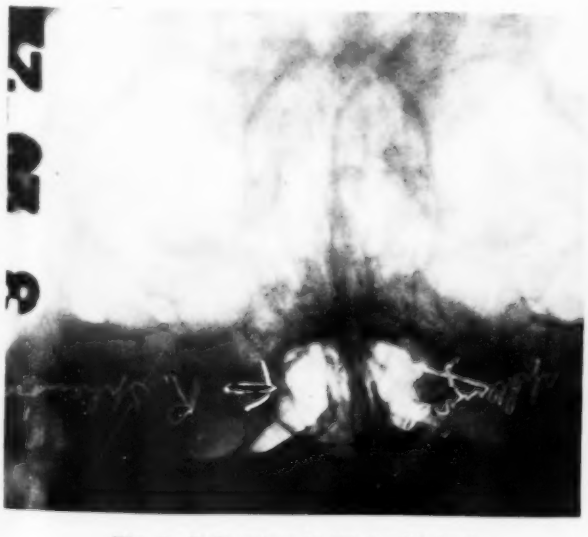


Fig. 3—Left sphenoid filled with lead.

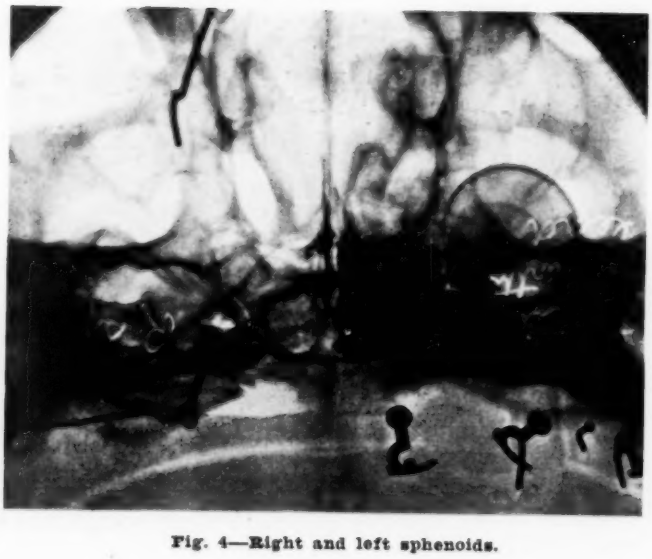


Fig. 4—Right and left sphenoids.

ABSTRACTS and REVIEWS

Unusual Case of Exudative Calcifying Fasciitis with Extensive Calcareous Intermuscular Deposits. Harry Lowenburg, M. D., Pennsylvania M. J., 26:21, October, 1922.

THIS rare case is described in detail and illustrated by accompanying radiographs. Apparently it is unique, since an imposing list of consultants are mentioned, none of whom had ever encountered such a condition. The calcification follows the fascial planes and does not involve the musculature, so that myositis ossificans is excluded At the present time, two years after patient came under observation, the calcification has spread over almost the entire body. W. W. W.

A Case of Paltauf-Sternberg Lymphogranuloma in the Ilium: Roentgen Ray Demonstration. A. Grossman *and* Weis-Ostborn, M. D., Fortschr. a. d. Geb. d. Roentgenstrahlen, 29:569, July, 1922.

SINCE Sternberg distinguished the clinical and anatomical entity of lymphogranulomatosis from the rest of the group designated by the name of pseudoleukoemia, a number of such cases have been described. Because these granulomas present changes similar to those found in tuberculous glands there arose a difference of opinion as to the causative agent. Reed, Coley, and Ziegler ascribed the tuberculous changes to a secondary tuberculous infection. Fraenkel and Much isolated gram positive, antiformin fast, granulated bacilli, which, however, were not acid fast. Cases of granuloma in almost all parts of the body were reported. The authors' case is one of granuloma of the ilium.

The patient was a woman of 30 whose two sisters had had enlarged glands in the neck, and one sister had died of a malignant lymph gland tumor in the mediastinum. At the age of 27 the patient had a swelling of the glands of the neck which disappeared by radiation. At the time of this report she had enlarged glands in the neck, axilla, and groins with loss of weight and anemia. She complained of severe pain in the left hip and leg, and had a rise in temperature. Examination revealed a mass in the region of the left ilium. The blood picture was normal except for a low hemoglobin index and 18,000 leukocytic count.

Roentgen ray examination revealed an oval area of rarefaction in the left ilium with irregular invasion of the edges. There was no periosteal reaction.

After a number of radiations, which only slightly affected the course of the illness, the patent died, and a histopathological examination established the diagnosis of lymphogranuloma.

The appearance of this disease in bones is interesting because of the ease with which it may be demonstrated roentgenologically. A. M. P.

Pathology of Ostitis Deformans, Paget's Disease. Sydney M. Cone, M.D., J. Bone and Joint Surgery, 4:751, October, 1922.

THIS is a detailed pathological study of the bones, tissues and organs of the case of Paget's Disease reported from the clinical standpoint by Hurwitz in the Johns Hopkins Bulletin, September, 1913. The patient died in December, 1920, and autopsy was performed, the result of which forms the subject of this paper.

The bone changes vary in the different bones and in varying parts of the same bone, apparently this is due to changed static and circulatory conditions. The degenerative changes in the vessels of the bones are out of all proportion to the degenerative changes elsewhere in the body. Many vessels are occluded by hyalin and vascular thrombi. Some appear ossified, others fibrosed and incorporated in the newly formed bone. The erratic formation of bone is remarkable. Bone absorption is taking place both by lacunar absorption and by fluids. New formation has ceased for the greater part. There are a few new osteoid deposits, covering Howships lacunae, and lining trabeculae of older bone. A characteristic feature is new formation and disappearance of new bone; there is a granular condition with widened lacunae and enlarging multiplying bone cells in the bone lining the canals. The marrow of clavicle and tibia is replaced by fibrous and myxomatous tissue.

It is not possible to abstract this article in its entirety. It will repay careful reading as a basis for interpretation of radiographic findings in such cases. W. W. W.

Ultraviolet Radiation in Rickets. (A compiled study), A. J. Pacini, M.D., Reprint abstracted by author.

THIS presents a study of authentic literature having to do with the ultraviolet therapy of rickets. It gives the title, author, and citation of twelve papers with the author's conclusion in every case, together with a comment by the compiler of the study.

Following this a method is advanced for the use of ultraviolet radiation such as will insure maximum application of the various principles propounded by the studies involved in the compilation.

Author's summary is as follows: (1) An abstract summary of the recent studies on the use of ultraviolet energy is submitted. (2) The ultraviolet region responsible for the proved therapeutic action in rickets is established. (3) The method for obtaining this necessary region at its maximum value is given in the choice of the lamp (air-cooled) the required tube voltage operation (70 volts); the necessary distance from tube to naked skin (40) inches. (4) The average exposure time for various subjects is given, together with a rule for determining the time and frequency of each subsequent exposure. (5) When other than tangential exposure is used, the necessary fraction of time increase depending upon angle of ray incidence is given.

A. J. P.

Studies of the Selective Ultraviolet Radiation in the Prevention of Experimental Rickets. A. J. Pacini, M.D. Reprint abstracted by author.

THE first part of the study is devoted to an appraisal of the intensity of the ultraviolet fraction of sunlight at different points of observations. The material is gathered from the data furnished by the Smithsonian Institute.

The second part of the study has to do with a comparison of the ultraviolet spectrum, as produced by the air cooled lamp, and the actinic spectrum of sunlight. The active region of the mercury vapor lamp spectrum is assumed to be that portion occluded by glass and terminating with the limit equivalent to the furthest extreme of the sun's spectrum. This means, in angstrom units the ultraviolet wave lengths of 3022, 2967, 2925 and possibly 2894.

Various filter materials that permit the passage to similar limited regions were tested against experimental rats fed on the McCollum diet; from which it is learned that the active therapeutic region of the spectrum is included between the wave lengths 3022 to 2900 angstrom units.

The author's summary is as follows: Data and experiments are presented showing (a) the limits of ultraviolet wave lengths in sunlight preventing experimental rickets (from 3022 to 2900 angstrom units). (b) The loss of ultraviolet intensity of solar radiation incident to season, time of day and altitude. (c) The limits of ultraviolet wave lengths from the mercury vapor arc in quartz effective in preventing exxperimental rickets (from 3022 to 2654 angstrom units). (d) A method for procuring desired selected wave lengths from the quartz mercury vapor arc through the use of especial filters.

A. J. P.

Ultraviolet Energy in Diseases of the Bone. A. J. Pacini, M.D. Reprint abstracted by author.

IT APPEARS definitely proved that ultraviolet energy exerts an increase in the calcium and phosphorus content of the blood.

Considering the various diseases of the bone in which a perversion of calcium and phosphorus metabolism is essentially involved, the application of ultraviolet energy is recorded with favorable findingsg in cases of osteoporosis from whatever cause, rickets, achondroplasia, osteogenesis imperfecta and osteomalacia.

AUTHOR'S SUMMARY

1. Reference is made to the proved property of air cooled ultraviolet energy (biologic) in increasing the calcium and phosphorus content of the blood and serum.

2. There is an important "special formula" required to effect this property; to obtain which the tube voltage (70 volts), tube-skin distance and exposure factors for various individual types are offered.

3. Conditions treated with striking clinical improvement include osteoporosis, rickets, achondroplasia, osteogenesis imperfecta, osteomalacia.

4. X-ray evidence of bone radiolucency indicating osteoporosis from whatever cause is a clinical index for the use of ultraviolet energy.

A. J. P.

The Roentgenogram and the Therapeutic Indications in Tuberculosis of the Bones and Joints. F. DeQuervain, M. D., Schweiz med. Wchnschr., 52:1021, October 19, 1920.

GENERAL points observed in the roentgenogram:

1. A diffused osteoporosis in absence of primary trophoneurotic disturbance generally indicates the presence of some organic disease of the particular bone.

2. If bone defects are present, an indistinct outline of the defective area and obliteration of the normal bony structure indicates a recent and still progressing lesion; good calcified deposits, an osteosclerotic zone about the lesion, smoothing of defect, and the reappearance of normal bone structure indicate an old lesion in the healing process, or even a healed lesion.

3. In tuberculous processes the periosteal reaction is of but little importance, so that its presence or absence is of little significance in the further course of the disease.

In the consideration of the lesions of the vertebrae, ribs and the hip, knee and ankle joints the author found the following:

Vertebrae: The therapeutic indications cannot be based upon the roentgen findings. Some cases with positive x-ray findings could be allowed to go about freely, while others with no findings had to be immobilized. The hazy appearance and abnormal tranlucency of the vertebra indicates the presence of the lesion. The treatment is mainly climatic and orthopedic. X-ray treatment is of value only in cold abscesses, while the possibility of injuring the spinal cord prevents the application of much therapy to the bone. The presence of a burrowing abscess in the roentgenogram indicates the continuation of therapeutic measures although the vertebra may appear normal.

Ribs: According to Iselin the great majority of rib tuberculosis results from an extension of a tuberculous condition of the lungs and pleurae. The diagnosis can be made by x-ray findings, and the treatment be directed to the primary cause.

Hip Joint: Operative procedures have been neglected on account of insufficiency of results. Roentgen ray treatment proved unsuccessful. Only climatic and orthopedic treatment prevail. By roentgen ray observation we follow the stages of destruction, gradual healing, calcification and ankylosis. Koenig's contention that the presence of a sequestrum requires operation is no longer held true, although its presence indicates that the process is not yet healed.

Knee Joint: When the process is limited to the synovial membrane any form of treatment, including roentgen ray, or all combined can be successfully applied. Where changes are found in the bone or cartilage resection and conservative treatment should be applied in young people. In old people amputation is the better way. The presence of sequestra indicates the absence of healing or at best clinically latent disease.

The Ankle Joint: The condition is about the same as in the knee joint, but it must be remembered that roentgen treatment in this region is more liable to injure the skin than anywhere else. The roentgen ray treatment should be applied cautiously.

Tarso-Metarsal Joints: This condition is very appropriate for x-ray treatment.

The Shoulder Joint: Roentgen ray treatment should be applied for some time, but if results are not good it should not be prolonged, but resection performed.

The Elbow Joint: Here also there are two types—the synovial and the bony. The conservative treatment including x-ray should be continued for some time before other measures are applied.

The Carpal Joint: What was said about the tarsal joints applies to carpal joints also. The same is also true of spina ventosa. A. M. P.

Cervical Rib. Samuel W. Boorstein, M.D., J. Bone and Joint Surgery, 4:687, October, 1922.

THIS author reports six cases of cervical rib, and quotes Honeij's observation that there are two interesting groups of cases in this connection; those that have the symptoms and do not show the ribs, and those without symptoms who do show ribs. The author adds the group who have the symptoms and do show the ribs. The symptoms are those of the local tumor, nervous symptoms, vascular symptoms, and muscular symptoms. The differential diagnosis is discussed with reference to the following: Arthritis; anterior poliomyelitis; Erb's palsy; subdeltoid bursitis; scoliosis; callus formation from fracture; neuritis; torticollis; exostosis; tuberculosis of cervical region; a cervical rib must be thought of in any case of sensory nerve symptoms along the distribution of the lowest branchial nerves, paralysis of the intrinsic muscles of the hand, vasomotor changes in the hand, and tumor or subclavian pulsations in the region of a cervical rib.

Stereoradiographs should be made. It is said that every enlargement of the transverse process of the seventh cervical is really a rib. In the six cases reported the x-ray examinations were all positive either for definite ribs or for other abnormalities associated with this deformity. W. W. W.

Bone Atrophy. Barney Brooks, M.D., Southern M.J., 15:823, October, 1922.

THE ATROPHY of bone which follows non-use is not due to a decalcification, but to a thinning of the entire bone. The bone which is left has the same chemical composition as the normal bone so that lime salts have not been diminished, the bone is simply smaller and thinner than normal. These bone changes begin to make their ap-

pearance within a few days after cessation of function. In experimental animals well marked changes are present in ten days, and are very marked after ten or twelve weeks.

Bones return to normal very slowly, if ever, after a long period of non-use. This should be remembered in treating fractures. Function should be suspended for as short a time as possible, else the recovery from the treatment will be as difficult as the healing of the fracture. Restoration of function should be the primary object of treatment and not simply the union of the broken bones.

W. W. W.

Roentgenological Contribution to the Diagnosis of Spinal Carcinoma in Cases Having an Unrecognized Primary Focus. Thomas Scholz, M.D., New York M.J., and M.Rec., 116: 566, November 15, 1922.

TWO very instructive cases are recited in detail, both showing fatal metastases from comparatively insignificant primary lesions. Early diagnosis of such lesions is to be arrived at by careful attention to the one symptom, pain, and by roentgenological examinations of the entire spine and other bones of the skeleton. In one of these cases, diagnosis was not made until two years after the onset of the pain; the primary focus was in the thyroid, and metastasis was in the lumbar spine. This case was characterized by long periods of remission, various methods of treatment being given credit for these remissions. The second case went eighteen months before diagnosis was made, there being a general carcinomatosis from a small lesion in the breast. The failure of the spine to collapse and the presence of a round gibbus at tumor site are the x-ray characteristics, differentiating the lesion from tuberculosis. Repeated x-ray examinations may be necessary.

W. W. W.

Etiology of Perthes' Disease in Traumatic Hip Joint Luxations in Children. Max Rehbein, M.D., Deutsche Zeitschr. f. Chir., 174: 416, Sept., 1922.

THE AUTHOR reports a case of an 8 year old boy, of good family history and previous normal health, who suffered an upward and somewhat backward dislocation of the head of the femur on the right side, caused by a fall. The roentgenogram revealed a perfectly normal femur in a condition of sublaxation. The reduction under anaesthesia was very easy and patient was discharged with a normally functioning hip. After some time limping set in, and one year later a typical Perthes' disease was diagnosed, both clinically and roentgenographically.

There are many reports of osteochondritis deformans juvenalis following reduction of a congenital subluxation on the same side or even on the other side. But so far there has been none of Perthes' disease following reposition after traumatic dislocation.

The usual etiology is thought to be trauma, infection, and constitutional tendency, while Schwartz emphasizes trauma, believing that the deforming process of the head is due to injuries to the vessels and interference with normal nutrition.

Brandes, however, believes the disease is due to some congenital developmental disturbance, which may possibly be familial. In many cases he could find no traumatic history. In some cases Perthes' disease develops in the normal hip when the other hip has been congenitally dislocated. Iselin cut the ligamentum teres in dogs and no Perthes' resulted.

The author is inclined to Schwartz's theory that Perthes' disease results from injury to the nutritional vessels, as evidenced in his own case. He explains that the blood supply to the head of the femur may come by way of the ligamentum teres and by way of the neck vessels. There is also an anastomosis between these two sets of vessels. In view of Lorenz's findings, that in cases of congenital dislocation in the first three years of life, the ligamentum teres is absent in 50 per cent of cases, and in five years the percentage is even greater, it is easily understood that a very slight trauma or a summation of slight traumas will easily interfere with the blood supply and produce the deformity.

A. M. P.

Measurements Based on Roentgen Examination of One Hundred Normal Children. Elizabeth Schulze, M.D., California State J. Med., 20:332, October, 1922.

IN STUDYING the disorders of the pituitary, aside from the visible changes and symptoms in the accessible portions of the body, the most direct method of approach on the living subject is by x-ray study of the sella turcica and adjacent regions.

Pacini has revived the study of the so-called sphenoidal angle of Welcker, having in mind the relation of this angle and the type of sella accompanying it to pituitary disorders. The original angle of Welcher lay between two lines, one from the nasion to the turcicon, the other from the turcicon to the basion. Pacini modified this angle, choosing, instead of the last line, one connecting the acousticon and the turcicon, claiming that this is directly analagous to the sphenoidal angle of Welcher.

The author's investigations tend to demonstrate that the angle used by Pacini is too variable for accurate measurement and that it is not analgous to the angle of Welcher. The angle of Welcher was then marked out on the plates and was found to conform more closely to those given by the old anthropologists. Further studies are contemplated which will be reported upon later.

W. W.W.

Necessity for Immediate and Through Roentgenological Study of All Injuries to the Spine. Halbert W. Chappell, M.D., California State J. Med., 20:436, December, 1922.

X-RAY examination of all injuries to the back will frequently, if not usually, throw light on the nature of the injury, even if an actual bone lesion is not demonstrated. It may show a type of spine whch is more easily injured or sprained by trauma, or an actual slip in the sacro-iliac region may be shown. Fractures may occur from comparatively slight trauma. Only the routine x-ray examination will prevent frequent error in handling back injuries.

W. W. W.

Hemorrhagic Osteomyelitis. George Barrie, M.D., J. Bone and Joint Surgery, 4:653, October, 1922.

THIS very comprehensive article is freely illustrated by radiographs, and is an excellent presentation of the subject. The importance of this lesion of bone is well recognized and its benign condition established, and the purpose of the paper is to illustrate these two facts. There are still surgeons who treat this lesion as a malignant neoplasm, whereas the x-ray evidence of regenerative repair and restoration of structure which is not found in malignancies, is ignored. The neoplastic theory for this lesion rests on the presence of giant cells and there is no proof that these are tumor cells. Hemorrhagic osteomyelitis is not a destructive lesion, but nature's effort to replace tissue previously destroyed, and this replacement may proceed to full architectural restoration of the bone substance.

About 75 per cent of the solitary lesions may be traced to bone trauma; other rarer factors are hematogenous infections, endocrinal glandular disturbance or bone malnutrition. Symptoms are usually mild unless the lesion is large; symptoms of acute inflammation are lacking. The pathology is that of a highly vascular granulation tissue filling the bone cavity, the microscopic picture duplicating in all respects that of granulation tissue.

A pre-operative diagnosis is not possible without the x-ray. In the radiograph the area of osteolysis shows as a

clear-cut rounded or oval spot in the cortex in large lesions this clear-cut appearance is less definite; expansion without breaking of the periosteum is the rule. In the author's experience no hemorrhagic osteomyelitis has penetrated the cartilage separating the epiphysis and diaphysis.

W. W. W.

Further Original Observations with the X-ray Upon the Appendix. Adolph Henriques, M.D., *and* Leon J. Menville, M.D., New Orleans M. & S. J., 74:292, December, 1922.

ATTENTION has previously been drawn to the appendix, apart from the rest of the digestive tract, as a focus of infection, due to retention of food remnants and their decomposition. The appendix may remin filled with opaque meal for days after the rest of the colon has emptied. The authors believe that the appendix fills as the results of anti-peristalsis which is normal in the colon; it empties by peristalsis. If it does not empty in normal time, this is due to defective musculature and is evidence that such an appendix is potentially dangerous, since it may retain bacteria, along with food remnants which act as a culture medium.

W. W. W.

Cysts of the Liver Shown in the Roentgenogram by Pneumoperitoneum and Inflation of the Abdominal Cavity with Nitroxydul. Werner Teschendorf, M.D., Fortschr. a. d. Geb. d. Roentgenstrahlen, 29:567, July, 1922.

FLUID filled cavities in the liver arise in the following conditions:

1. Cysts around foreign bodies, including parasites.

2. Cysts formed through decomposition of solid tissue (tumors, tubercle, gumma, hematoma).

3. Cysts arising from physiological or pathological structures; either retention cysts which usually contain bile colored matter or those arising through wall formation such as proliferative cysts, cystomas, cystadenomas and adenocystomas.

When these cysts are of any considerable size, they can be demonstrated fluoroscopically by the pneumoperitoneum method.

To inflate the peritoneal cavity the author successfully used nitroxydul, a gas which is non-irritative and is quickly absorbed. The absorption of this gas is very gradual and is completed at the end of three hours. Its great solubility, exceeding that of oxygen, eliminates possibility of air embolus. The quantity used for fluoroscopic purposes has never caused any untoward results.

Nitroxydul is obtained by heating ammonium nitrate and distilling the obtained gas through iron sulphate in concentrated sulphuric acid, and again through concentrated potassium hydroxide.

A. M. P.

Diagnosis of Syphilitic Aortitis. W. H. Deaderick, M.D., J. Arkansas M. Soc. 18:109, November, 1922.

IN THE diagnosis of aortitis, the symptoms, physical signs and x-ray examination must be considered.

The symptoms are usually so vague that they do nothing more than suggest an examination of the heart; the most frequent symptoms are pain and dyspnea. Likewise the physical signs are only sufficiently suggestive to indicate x-ray examination, and upon this the final diagnosis must rest. The fluoroscopic and orthodiagraphic examinations will show whether there is a dilatation of the aorta or not. Given the presence of aortitis, although syphilis is more frequently the cause than all other infections combined, it is by no means the only cause. Rheumatic fever takes next place, and as an occasional cause, streptococcic infection must be borne in mind. Typhoid fever and influenza are rare causes; arteriomatous degeneration as a part of a general arteriosclerosis may show the shadows of a dilated aorta on the fluoroscopic screen.

W. W. W.

Treatment of Skin Cancer by X-rays, Radium and Electrocoagulation. G. E. Pfahler, M.D., New York M. J. and M. Rec., 116:553, November 15, 1922.

PRACTICALLY all cancers of the skin can be successfully treated by means of x-rays, radium and electrocoagulation, provided they are treated early and skilfully.

Precancerous dermatoses are best treated by electrocoagulation, using a fine brush spark from the Oudin current; they may also be treated by x-rays. Warts and moles are best removed by electrocoagulation using more current; they will also respond to x-rays and radium. Basal cell epitheliomas respond readily to any form of treatment which destroys the cancer cells; the preferable method is a destruction by the Oudin current followed by a full erythema dose of x-rays. Where a scar is objectionable, the x-rays and radium are preferable, either agent being effective. Squamous cell epitheliomata are more difficult to cure and thorough treatment is essential. Three or four erythema doses should be used at once, or the dose kept at the point of saturation until the lesion disappears. Adjacent glandular areas should be thoroughly treated. Incomplete treatment is worse than no treatment. In epitheliomata with metastases, the author's preference is the burying of radium in the metastases, rather than surgical removal. In many cases, two or more methods can be combined to good advantage.

W. W. W.

Value of X-ray in Skin Diseases. M. V. Leof, M.D., New York M. J. and M. Rec., 116:377, October 4, 1922.

THE X-RAY is the most potent factor in the treatment of skin diseases and by far the most valuable single agent we have. It is useful in nearly every disease of the skin; in some it will only alleviate symptoms; others will abate temporarily after treatment, and still others will be cured permanently.

In acne vulgaris the x-ray is superior to all lotions, salves and vaccines; ten to sixteen fractional doses will usually effect a cure.

In sycosis vulgaris the results are not constant; on account of excellent results in some cases, all cases should be tried.

In furunculosis the x-ray is of great value in treatment of recurrent lesions.

In tinea tonsurans depilation of the scalp will cure all cases, and this may be accomplished in one sitting.

In favus the same results may be accomplished.

Eczema usually embraces a variety of skin conditions, and definite statements cannot be made in a general way. The x-ray, along with other methods, will usually be of benefit.

Psoriasis responds readily to radiation, but recurrences are common.

In regional pruritis, unless caused by diabetes, x-ray is of distinct value.

Tuberculosis of the skin and allied conditions are not favorably influenced. (Abstractor's note: This is contrary to the experience of many radiologists).

Warts respond readily to x-rays, multiple warts being removed without scars or pain.

Senile keratoses will be removed by one or two exposures.

Nevi are not, as a rule, satisfactorily treated by rays.

Young and small keloids invariably disappear under the rays, and will not recur.

Rhinoscleroma is curable by x-rays as is dermatitis papillaris and acne keloid.

Radiotherapy is the method of choice in the treatment of most skin malignancies.

W. W. W.

Quartz Lamp Therapy. A. J. Pacini, M.D. Reprint abstracted by author.

A CLINICAL catalog of various conditions in which quartz lamp therapy (ultraviolet radiation from air-cooled and water cooled equipment) is useful is presented.

The information is culled from an experience gained by observing competent users of equipment at work in their offices, dispensaries and hospitals; by maintaining an intimate correspondence with distinguished clinicians who are utilizing ultraviolet energy with obvious success; by studying the literature that has appeared in Italy, France, England, Denmark and Germany; by studying American literature.

The first section is devoted to an enumeration of skin conditions and includes acne, baldness, chancre (soft), epithelioma, erysipelas, furunculosis, gangrene, lupus, nevus, scars and ulcers.

Not all of these conditions are bettered; the author points out the various pitfalls and the indications for choosing energies other than ultraviolet.

The next question is devoted to the study of anemia, cachexias, chlorosis and fevers. It presents a principle of "fixation" of metabolites which gives a useful concept in determining the course that should be used when ultraviolet energy is employed as an adjuvant in the treatment of these various conditions.

Then there is a section devoted to certain digestive disorders, wherein mention is made of auto-intoxication, cirrhosis of the liver, constipation, gastric ulcers, gastritis and hyperacidity.

Certain nervous disorders are commented upon, including hysteria, locomotor ataxia, melancholia, myelitis, neuralgia, neuritis.

The sixth section discusses gynecologic entities with reference particularly to amenorrhea, dysmenorrhea, metritis, ovaritis.

"This brief enumeration of conditions is only a partial list of indications calling for ultraviolet energy. Of course, our knowledge for the use of the energy in these conditions is in many cases empiric, but empiricism resulting from the close observation of prominent clinicians can not be considered as beneath the level of the scientific worker. We may conclude by saying that the solution of the mechanisms whereby ultraviolet effects a clinical remedy in the diseases mentioned offers an unusual opportunity for research investigation that must inevitably lead to a more advanced and clinically brilliant therapeusis."

A. J. P.

Early Diagnosis of Cancer of the Stomach. Jonathan Forman, M.D., Ohio State M. J., 18:764, November, 1922.

EVERY satisfactory gastro-intestinal diagnosis rests, as someone has said, like a stool, upon four legs, viz., (1) history; (2) physical examination; (3) x-ray study, and (4) laboratory findings. Neglect of any one of these invites failure.

In the history, failing appetite, acid eructations and pain are the usual symptoms. However, pain may be absent and the appetite good. In the physical findings, loss of weight and loss of strength are the most important.

The x-ray findings are more or less characteristic, though some cancers are difficult of detection. The examination should be thorough, both by fluoroscope and by radiographs in various positions. The direct visualization of the filling defect is the only positive sign of cancer. The indirect evidences (Carman) need to be interpreted along with the other findings.

The laboratory examinations have unjustly been pushed into the background by the emphasis laid on the x-ray examination. Examination of the fasting contents gives the best evidences of cancer.

When the clinical history, the physical findings, the x-ray study and the laboratory data are combined, they will form a net through which few cancers of the stomach can escape.

W. W. W.

Experimental Duodenal Stenosis and Atony of the Stomach. Walter Konnecke, M.D., Zentralbl. f. Chir. 49:1617, November 4, 1922.

THE AUTHOR produced artificial duodenal stenosis and kinking in five dogs by narrowing the duodenum with a strip of fascia and attaching it to the costal arch. The operation was well borne by all of them. At first only liquid food was given, later, solid food, and after a short time the dogs appeared to be normal in appetite, in bowel movements, etc. Roentgenological observations showed a highly increased peristalsis, good tonus of the stomach and duodenum. On section there was marked hypertrophy of the stomach and duodenum. The conclusion is that the healthy stomach and duodenum react to stenosis and kinking by hypertrophy and hypermotility.

In a second series the author produced artificial atony by double subdiaphragmatic vagotomy. Roentgenological evidence showed constant atony and ectasia of the stomach. No resemblance to the human form of gastric atony was found.

Entirely different results followed when a combination of the two was applied. Of the four dogs with combined artificial stenosis and double vagotomy, three died of the operation in about one week. The fourth dog, however, succeeded in overcoming the critical period and recovered.

Section showed the stomach musculature flabby. There was marked enlargement, the stomach occupying half of the abdominal cavity, the duodenum also was somewhat dilated. While the author hesitates to apply his experimental observations to human pathological conditions without further study, yet he finds here some resemblance to the clinical picture of acute duodenal stenosis with disturbance of innervation. The fact that with normal innervation the stomach reacted well to the acute stenosis shows that the pathological picture of the acute duodenal stenosis is not purely mechanical; that the dilatation of the stomach is not secondary to the stenosis of the duodenum, but that the stomach condition is primary, due to disturbances in innervation, and the stenosis of the duodenum is secondary. The weakened vagus action results in an increased sympathetic activity. The increased sympathetic activity may also come from injury to the vagus by toxins in acute infections, or by operative injuries to the plexus of the stomach wall in various abdominal operations, or even by some endocrine disturbance.

A. M. P.

Ray Treatment of Cancer. J. Thompson Stevens, M.D., New York M. J. & M. Rec., 116:386, October 4, 1922.

THERE is no question about the operative removal of any malignancy which can be removed entirely. When metastases cannot be removed entirely, cases should not be operated, or if operated, should receive preoperative and postoperative radiation.

When radium is to be used, x-rays should precede, being directed to the lymphatics and borders of the disease.

Radium is the ideal agent for use within the growth itself, within metastases and for recurrences, the preferable time being between the x-ray exposures.

Recent advances in radiation therapy have given a more definite technique and better results are to be expected.

W. W. W.

Physical Basis of Deep Roentgen Therapy. Frank Rieber, California State J. Med., 20:350, October, 1922.

IN CONSIDERING deep roentgen therapy from the physical standpoint,

only one biological factor needs consideration, the balance of the problem being physical or engineering. That biological factor is stated thus: (1) Any living tissue, if exposed to a small quantity of roentgen radiation, is stimulated to a condition of greater activity.*

(2) If the amount of roentgen rays delivered to this tissue is increased, the activity of the tissue is not stimulated further, but on the contrary, is inhibited and if the radiation is further increased the tissue is destroyed.

The biological problem then is to deliver the largest permissible quantity of rays into a tumor without exceeding the safe limit of radiation in any other part of the body.

The author then discusses the physical principles of rays of low penetration and of high penetration (short wave lengths), and the variations in depth absorption, together with the importance of scattered radiation in using high voltages. The engineering problems involved in constructing apparatus to deliver high voltages are not difficult, although the tubes at present available have their limit of safety around 220,000 volts.

*Abstractor's note: This is not a generally accepted biological law, many radiologists contending that x-rays are destructive in any dose and are never stimulative.

W. W. W.

Roentgenology in Its Relation to the General Practitioner. W. M. Phelps, M.D., Virginia M. Monthly, 48: 444, November, 1922.

ROENTGENOLOGY is one of the most highly specialized branches of medical practice. The relation of the roentgenologist to the physician and surgeon is that of a consultant solely, thereby differing from other specialties. The value of the roentgenologic examination depends entirely on the ability of the roentgenologist to interpret the shadows in terms of pathology. In many instances the roentgenologist must study the case as a whole and in connection with other methods of examination before an intelligent opinion can be rendered. Several illustrative examples, in connection with lesions of different organs or regions of the body are given.

W. W. W.

Cancer of the Larynx Treated by Radium. Douglas Quick, M.B., *and* F. M. Johnson, M.B., New York State J. Med., 22:462, October, 1922.

IN APPLYING radium to laryngeal growths, certain difficulties arise which are not met with in other parts. If applied efficiently, radium produces a sharp inflammatory reaction which interferes with swallowing and breathing, so that a definite estimation of what is to be hoped for must be made, and treatment given accordingly. A great advance in treatment has been secured through the practice of introducing emanation tubes directly into the growth. Detailed description of dosage and filtration is not given. Statistics of the cases treated during the past five years are given and cover 156 cases. The conclusions are as follows:

While radium offers a hope to a larger number of cases of cancer of the larynx than older methods, its use is still experimental.

Before treatment is started, an estimation of what can be hoped for should be made and treatment given accordingly.

In primary operable intrinsic cancer, radium treatment may be permissible, but the evidence to date has not established it as the method of choice.

Pre-operative treatment may materially improve the end result.

Surgical exposure may be required for proper radium localization.

Radical use of intensive radiation is permissible in cases offering a reasonable hope of complete recovery.

In inoperable cases, the conservative use for palliative relief is advocated.

In very advanced cases, radium should be withheld.

W. W. W.

Diagnosis and X-ray Treatment of Toxic Goiter, with Report of Five Cases. W. E. Killinger, M.D., Virginia M. Monthly, 48:469, November, 1922.

GREAT care must be exercised in the diagnosis of thyroid enlargement, as a certain amount of enlargement is sometimes physiological; some of the later laboratory methods, in addition to a careful history and analysis of the sysptoms, will be of value.

The employment of x-ray in treating goiter dates back to 1898, and many articles reporting favorable results are to be found in the literature. Five cases are reported where these results were obtained. These cases were of the hyperplastic type; careful physical examinations were made with metabolic readings in the beginning, again after three treatments, and, finally, after the symptoms had disappeared.

The technique used was a one inch spark, 6 mm. aluminum filter with one thickness of sole leather, 8 inch skin distance, 6 ma. of current for 12 minutes over each area, treating three areas, one over each lateral lobe and one over the thymus. Dose repeated in three weeks.

W. W. W.

X-ray Treatment of Tonsils and Adenoids: A Preliminary Report. Sidney Israel, M.D., Texas State J. M., 18:301, October, 1922.

THE author has attempted to prove to his own satisfaction whether the claims of Witherbee are justified and whether radiotherapy of tonsils and adenoids should have a prominent place in the treatment of these structures. The cases selected for x-ray and radium treatment have been those deemed inoperable because of various reasons. As the result of his work, the author found that x-ray or radium would produce a definite atrophy or shrinkage of the tonsil and adenoid tissue. In many cases in which one could express quantities of cheesy material from the crypts before treatment, this was no longer possible, after the atrophy occurred. Further the local symptoms disappeared. He compares the two methods of treatment as follows:

Operation: Hospital expense, anesthetic with possible pneumonia or lung abscess, contraindications frequent, hemorrhage, pain, loss of weight, loss of time, no tonsils, deformity from scar tissue or injury, time consumed about ten days.

Radiotherapy: No hospital expense, no anesthetic or anesthetic dangers, no operation, no hemorrhage, no pain, no loss of weight, no loss of time, tonsils atrophied, but still present, no deformity or injury, time consumed six to ten weeks.

The author feels that radiotherapy will not replace a well and carefully performed operation, there is a strong likelihood that a definite place will be established for radiotherapy in laryngology, as a therapeutic measure applicable to a certain number of cases.

W. W. W.

Chronic Non-Tuberculous Lung Diseases. W. Warner Watkins, M.D., Texas State J. Med., 17:396, December, 1922.

NON-TUBERCULOUS chest diseases are too frequently diagnosed as tuberculosis, without sufficiently careful consideration of the other possibilities. The non-tuberculous chest conditions which are mistaken for tuberculosis may be divided, for convenience in study, into three classes.

1. Conditions which are not essentially lung diseases, such as cardio-renal syndrome, aortitis and aneurism.

2. Non-infective conditions, such as tumors, pneumoconiosis and foreign bodies.

3. Infections, the three most important classes being syphilitic, mycotic and post-influenzal, including metastatic.

These various conditions and their differentiation from tuberculosis are discussed. W. W. W.

X-rays in the Diagnosis of Pulmonary Tuberculosis. John D. MacRae, M.D., Southern M. J., 15:870, November, 1922.

1. Stereoscopic lung plates are most valuable, and all other methods of x-ray examination are secondary in value.

2. Interpretation of x-ray of the lungs should be made independently of the clinical findings in the case.

3. The radiologist and clinician should hold a conference on each case examined and compare notes on their separate findings.

4. Terminology and technique should be standardized.

5. Studies should be made of the normal chest in order to interpret plates of the pathological.

6. Postmortem examination of tuberculous patients should be made as often as possible, for the purpose of correlating densities in the x-ray plates with actual lesions in the lungs.

W. W. W.

A Study of the Clinical and Radiological Findings in Pleurisy. Drs. M. B. and P. F. Titterington, I. Missouri M. A., 19:465, November, 1922.

THE USE of the x-ray in pleurisy is only one method, but is a great aid in helping the clinician to arrive at exact conditions.

In dry pleurisy, there is obscurity at the base of the lung, the diaphragm is hazy and deformed and loses its mobility; the costo-phrenic angle may be partly or wholly effaced.

In pleurisy with effusion, the x-ray aids not so much in the initial diagnosis as in following the progress of the case, noting from time to time whether the fluid increases or decreases.

In the dry interlobar pleurisy, the x-ray is about the only means of diagnosis, and great care must be exercised in the examination, otherwise this method will fail. The signs are more evident when interlobar effusion occurs.

W. W. W.

Diaphragmatic Hernia — Non-Traumatic, with Report of Four Original Cases. E. H. Kessler, M.D., J. Missouri M. A., 19:461, November, 1922.

TRAUMATIC cases are not rare, but congenital cases are quite infrequent. It is not always possible to exclude trauma. The four cases reported, with radiographs, had no history of trauma, two of them dating back into childhood, the other two dating back some years. All were in adults. X-ray examination will usually make plain the condition, although the clinical history is usually misleading, and the viscera may pass in and out of the thoracic cavity. W. W. W.

Radium in the Treatment of Myelogenous Leukemia. A. Henriques, M.D., *and* Leon J. Menville, M.D., New Orleans M. & S. J., 74:247, November, 1922.

THE technique of application, for which the authors claim originality, consists in the application of radium externally over the area of splenic enlargement. The dosage consists of 2,200 to 2,400 milligram hours spread over four areas near the center of the spleen, repeated monthly; this means that each area receives 550 to 600 milligram hours, the areas being one inch square, the radium elevated ¾ inch from the skin surface and filtered through 2 mm. of lead.

W. W. W.

Roentgen Ray Treatment of Adenopathies. Mulford K. Fisher, M.D., New York M. J. & M. Rec., 116: 389, October 4, 1922.

LYMPHATIC disease is usually a secondary phenomena and the indications for x-ray treatment are applicable only to selected cases. A careful search and exploration for the underlying pathology must be made and first effort directed toward its elimination. The conditions which respond to x-ray are quoted from Knox, as follows: Inflammatory enlarged glands, lymphadenomatous glands, sarcomatous glands, tuberculous glands, carcinomatous glands, mixed infections. The author adds the lymphoid tissue of the tonsils and adenoids.

The inflammatory type of enlarged glands rapidly responds to x-ray treatment, and surgery has practically been abandoned in this type of case, especially in the cervical adenitis of children. The tuberculous type responds more slowly and recurrences are frequent; the thymic enlargements come under this same head and yield readily to radiation.

The lymphadenomatous glands, including Hodgkin's, rapidly recede, but practically always tend to reappear.

The carcinomatous glands respond slowly, and the effect of radiation is variable.

The tonsillar and adenoid tissues shrink and atrophy under radiation, and this method of treating disease of these structures has opened a wide field.

W. W. W.

Cancer of the Breast: Combined Treatment by Surgery, Radium and X-ray. John T. Moore, M.D., Texas State J. Med., 17:352, November, 1922.

RODMAN, in 1908, said that "there is but one treatment for cancer of the breast—operation—the earlier the better." Surgical technique having about reached its limit, surgeons have begun to look to other remedies as adjuncts, and today, surgery, radium and x-ray represent the sum total of all the methods we possess in combating cancer. For inoperable cases, radium and x-ray offer the only palliative treatment.

For the operable cases, the following is considered the best present method: The first and most important requisite is the service of a thoroughly trained and optimistic roentgenologist. The body from the navel up to the neck and including the axillae is blocked off into ports of entry and a full dose given to each of them, beginning with the peripheral, the glands and tumor being rayed last. Since it requires from three to four weeks for sufficient fibrosis to block lymph vessels, operation should not be done for at least three or four weeks, probably not later than six weeks. After this time, a radical and clean dissection should be done, removing breast, glands and gland-bearing fascia. Muscles are not removed. preoperative and postoperative raying is depended upon for these. After the operation is controlled and bleeding stopped, radium properly screened is placed in the axilla, so arranged that it may be drawn down and expose the subscapularis, latissimus dorsi and serratus muscles; where there is sufficient radium, the supraclavicular and infraclavicular regions should be rayed, with especial attention along the outer border of the sternum and the region about the lower end of the sternum. The radium may be left in position from six to ten hours, then drawn into a new position. After a period of ten days to two weeks, the body is again blocked off into areas, and again thoroughly rayed, with especial attention to the areas where metastases are likely to occur—the mediastinum, axilla, clavicular regions, epigastrium, inner and lower part of the opposite breast and the intercostal areas over front and back. Additional treatments should be given in from six to eight weeks following the last radiation. Watch for recurrences and treat these as soon as they are seen.

Some patients will die in spite of all you can do, many will surprise you by living longer than you thought they could, and a few of the severe cases will get well. W. W. W.

Treatment of Uterine Cancer. Rex Duncan, M.D., Texas State J. Med., 17:366, November, 1922.

THE RESULTS of surgical treatment are graphically shown by the figures of Janeway, who tabulated the results of 6,000 cases reported by surgeons of this country and Europe. These results show that, for every 100 patients presenting themselves for surgical treatment, 60 must be turned away without treatment; of the 40 who are operated on, 18 per cent, or 7 patients, die as the result of the operation; 8 patients will be cured and the remaining 25 will have a recurrence. The 60 who are turned away, the 7 who die from the operation and the 25 who have recurrences, leave only 8 per cent who are cured, and 92 out of each 100 patients are doomed unless some other method than surgery comes to their relief.

The rapid progress in radium therapy in uterine cancer, and the more recent addition of high voltage x-ray therapy offer good reasons for believing that this mortality can be lessened. The present procedure is somewhat as follows: During a hospital period of from five to seven days, the patient is given a total of 6,000 to 10,000 millicurie hours. After the local reaction has subsided, in from six to eight weeks, she is given a thorough radiation with high voltage x-rays.

In a total of 300 patients treated, more than two years ago, there are 122, or 40 per cent, who are clinically well for periods ranging from two to seven years. Of these there were 272 cases who were inoperable, and of these, 99, or 36.4 per cent are clinically well.

W. W. W.

The New Roentgenotherapy in Gynecology. James T. Case, M.D., Texas State J. Med., 17:360, November, 1922.

THE essentials of the "new roentgenotherapy" which is attracting so much attention at the present time are (1) long target-skin distance, (2) high voltages of 200,000 volts or higher, (3) high filtration of from 0.5 to 1 mm. of copper, (4) large areas of treatment, or ports of entry. The object of all these essentials is to deliver a greater percentage of x-rays into the deeper tissues and a minimum of rays which are absorbed by the skin. Any lesions which are accessible can be attacked more rationally by a combination of radium and xx-ray.

When the massive dose is to be given as nearly as possible at one seance, the patient requires the same preparation as for a major surgical operation. The object of the attack is to deliver to the area under treatment approximately 120 per cent of the skin erythema dose for carcinoma and 70 per cent for sarcoma, this dose to be evenly distributed to all the pathological tissues at one sitting. In practice the dose is seldom given at one sitting, but is distributed over two or three days with an added day for the radium application. Under the working conditions of the author, 800 mam., at 200 kv., with 1 mm. of copper filter, 50 cm. skin-target distance, produces a mild erythema on the skin of the neck; immediately after the treatment there is a reddening of the skin, followed in about three weeks by a definite light brown discoloration which later becomes more marked. For uterine carcinoma, four areas are treated, the anterior and posterior fields being 16 to 20 centimeters square, lateral areas smaller. The author follows the Freiburg school in administering the dose as quickly as possible, through as large ports as possible, although he describes the Erlangen technique from which just as favorable reports have come. By this latter technique the pelvis is divided into three zones; the first aimed at the uterus is treated through six or seven small portals; after six weeks the right pelvis is treated through six small portals, and after an additional six or eight weeks, the left pelvis in a smaller manner. The author has not noticed any significant changes in blood findings, a fall of four or five per cent in red cells being the maximum change noticed. Rectal and bladder tenesmus are fairly frequent sequels. Roentgen sickness is a frequent and very disturbing sequence.

The immediate results since this treatment was started in January, 1921, have been very encouraging, and the outlook for permanent results is bright.

W. W. W.

Radium in the Treatment of Menorrhagia and Metrorrhagia, with Case Reports of Forty Successful Cases. E. T. Newell, M.D., J. Tennessee M. A., 14:266, October, 1922.

THIS STUDY includes only the cases of hemorrhage due to hyperplastic endometritis of long standing. The treatment in such cases is so effective that other methods need not be considered. The discussion does not include cases of hemorrhage due to fibroid tumors, polyps, malignancies, infections, etc. Patients are divided into two groups, those at or near the menopause and younger patients (20 to 35), the treatment differing materially in technique. In young women under 35, the radium is introduced directly into the cervical canal and uterus without preliminary dilatation and without previous curettage. Fifty milligrams are inserted and left four to eight hours. Treatment is repeated only if the following menstrual flow is excessive, the dosage being less at the second application. In cases at or near the menopause, dilatation and curettage should be done on account of a possible malignancy, the radium being applied at the time of curettage, and the time of application lengthened in order to establish the menopause more promptly. If the scrapings are found to be malignant, radium in appropriate doses or surgical procedures, as indicated, should be followed. Several case reports are given. W. W. W.

Radium Therapy of Benign Uterine Hemorrhage. H. Kupferberg, M.D., Fortschr. a. d. Geb. d. Roentgenstrahlen, 29, June, 1922.

THE AUTHOR has used radium element for intra-uterine applications since 1914. Four hundred and fifty cases were irradiated, of which 338 were myomata, and 122 were metropathies.

Technique: After careful disinfection the cervix is dilated, and 50 mgms. of radium element filtered with 1.5 mm. brass, 1.0 mm. silver, or 0.8 mm. gold introduced into cavity. Sometimes introduction into the cervix or even into the vagina is sufficient.

Dosage: To produce permanent amenorrhea 1,800 to 2,000 mgm. hours are required. Less duration gives only temporary amenorrhea.

Results: In 43 young women there was marked shrinkage of the myomata, with menstruation after one year. Six of them gave birth to healthy children subsequently.

Indication: Menorrhagia, metrohagia, juvenile and climacteric menstruation, myomata below the level of the navel, stubborn cervical catarrh, osteomalacia, inflammatory tumors of the adnexa, and for artificial sterilization.

Contraindications: Myomata having undergone softening, and submucous myomata. Where malignancy is suspected 4,800 mgm. hours should be given. In cases of inflammatory tumors of the adnexa the application must always be intravaginal.

Action of the rays: The action of radiation is not directly on the ovarian tissue, but secondarily through the endometrium and myometrium.

Sequelae: There often occurs a bloody discharge. Atrophy of the myomata is accompanied in 60 per cent of cases with atrophy of the follicular apparatus and of the endometrium. There is no atresia, there is no disturbance of the libido, and no shrinkage of the vagina. False passage avoided by careful technique.

A. M. P.

Radium in Gynecology. O. L. Norsworthy, M.D., Texas State J. Med., 17:370, November, 1922.

THE conclusions of this author as to the use of radium in gynecologic conditions are as follows:

(1) Radium is probably the greatest discovery of interest in the treatment of gynecological conditions since Simpson discovered the general anesthetic in 1847.

(2) Radium is the safest, surest and most adaptable remedy in hemorrhage at the menopause, especially when associated with a chain of neurotic symptoms.

(3) In soft, rapidly growing uncomplicated myomas, if not larger than a four months pregnancy, in women over 40 years of age, radium is uniformly effective and is the safest remedy known.

(4) Radium has no equal as a palliative in inoperable cancer of the uterus.

(5) In the light of what has already been accomplished with radium, I am encouraged by the hope that with more knowledge of the properties, its rays and improved technique of application, cancer may eventually meet its master.

(6) Less than 125 mgm. of radium will not permit of sufficient range in dosage to promise the graded dosage used in non-malignant conditions, in addition to the heavy doses necessary in treating cancer. W. W. W.

Value of Transuterine and Transabdominal Gas Inflation of the Female Pelvis with Carbon Dioxide. Roland S. Cron, M.D., Wisconsin M. J., 21, November, 1922.

SINCE the work of Peterson and Van Zwaluwenburg in this method of pneumoperitoneum, the procedure has become so popular in the University of Michigan hospital that it has become necessary to establish an inflation clinic, and any case whose diagnosis is in doubt after the usual history and examination is referred to this clinic for further study. The practice in this clinic is to have the roentgenologist's opinion given entirely aside from any knowledge of the history or previous examination. The apparatus and instruments used have been previously described. Transuterine inflation is the method routinely used, and carbon dioxide is the gas employed. This is the best and most reliable method of establishing the patency of the fallopian tubes. Further, for the examination of the pelvic organs, this method is of great value. A chronic salpingitis or salpingo-ovaritis, and pelvic adhesions are easily recognized. Pregnancy as early as the fifth or sixth week has been diagnosed. Fibroids of the uterus and ovarian cysts are recognized without difficulty. W. W. W.

Treatment of Carcinoma of the Uterine Cervix. Stanley A. Clark, M.D., J. Indiana M. A., 15:339, October, 1922.

THE surgical extirpation of carcinoma of the cervix has been extensively and more or less radically employed for the past forty years, but the literature of the past year contains few opinions favorable to the continuance of these radical operations. A notable exception is Cobb, who claims 57 per cent of cures in sixty cases of hysterectomy for moderately advanced carcinoma of the cervix. Could such a percentage be maintained by other surgeons, there would be no reason for seeking other methods, but a distinct pessimism pervades the writings of our greatest surgeons; and during the past five years, more and more attention has been given radiation therapy. Many surgeons use radium as an adjunct to surgery, but the author believes there is no such middle ground and that the cases are either surgical entirely or should be treated solely by radiation. If pre-operative radiation is used, this should be by x-ray to the maximum dose of deep radiation, followed by radium in the vaginal vault and a second course of x-ray. His personal observation is that the combined use of radium within the cervix and uterus and deep roentgenization from without offers the best hope to the average patient presenting herself to the surgeon for treatment of cancer of the cervix. The results of this method are not ideal, but they are the best that offers today. W. W. W.